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S. HRG. 103-604

SOIL AND WATER QUALITY

Y 4. AG 8/3: S. HRG. 103-604

Soil nd Water Quality, S. Hrg. 103-...

HEARING

BEFORE THE

SUBCOMMITTEE ON
AGRICULTURAL RESEARCH, CONSERVATION,
FORESTRY, AND GENERAL LEGISLATION

OF THE

COMMITTEE ON AGRICULTURE,
NUTRITION, AND FORESTRY
UNITED STATES SENATE

ONE HUNDRED THIRD CONGRESS

SECOND SESSION

ON

THE NATIONAL RESEARCH COUNCIL'S RECENT REPORT ENTITLED SOIL AND WATER QUALITY—AN AGENDA FOR AGRICULTURE

JANUARY 27, 1994

Printed for the use of the
Committee on Agriculture, Nutrition, and Forestry

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NATIONAL RESEARCH COUNCIL'S RECENT REPORT ENTITLED SOIL AND WATER QUALITY—AN AGENDA FOR AGRICULTURE

THURSDAY, JANUARY 27, 1994

U.S. SENATE,
SUBCOMMITTEE ON AGRICULTURAL RESEARCH,
CONSERVATION, FORESTRY AND GENERAL LEGISLATION,
Washington, DC.

SUBCOMMITTEE ON AGRICULTURAL RESEARCH, CONSERVATION, FORESTRY AND GENERAL LEGISLATION, OF THE COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY

The subcommittee met, pursuant to notice, at 3:03 p.m., in room SR–332, Russell Senate Office Building, Hon. Thomas A. Daschle, (Chairman of the Subcommittee) presiding.

Present or submitting a statement: Senators Daschle, Harkin, Cochran, Craig, and Grassley.

STATEMENT OF HON. THOMAS A. DASCHLE, A U.S. SENATOR FROM SOUTH DAKOTA

Senator DASCHLE. The hearing will come to order. I want to welcome our witnesses and other participants today to this the first hearing of our subcommittee for this year. The purpose today is to discuss the policy and research recommendations outlined in the recent report of the National Research Council's Board on Agriculture entitled Soil and Water Quality, an Agenda for Agriculture. I have taken a great interest in this report.

South Dakota continues to derive more of its total income directly from agriculture than any other sector of the economy, and there may be no more important agenda as we begin planning for implementation of new directions in agricultural policy this year, and on to the farm bill next year.

To achieve continued success in our Nation's agricultural sector, we have to recognize and preserve our soil as a precious natural resource, and likewise ensure a water supply that is unsullied by agricultural sediment, chemicals or nutrients. We must understand how soil quality relates to water quality, and develop ways for producers to farm effectively and profitably without aggravating environmental problems.

Years ago, our main concern about soil quality was soil loss through erosion. Images of the dust bowl, which devastated farm land in the 1930's, come to mind. Our Government quickly responded to this concern with the creation of such initiatives as the

Soil Conservation Service, conservation cost-share programs and the Conservation Reserve Program. Through these programs, we have made considerable progress towards alleviating the erosion problem, but there is still need for improvement.

As a result of increased scientific knowledge, we now realize that there are other equally important concerns about soil and water quality. These include soil compaction, salinization, and pollution of water by soil nutrients and animal waste. Our agricultural and environmental policies must reflect this evolving scientific knowledge base by addressing these new concerns. As noted in the National Research Council's report, the 1990 farm bill set the stage for agriculture's active participation in enhancing environmental quality by authorizing several reasonable incentive-based programs to address these problems. Unfortunately, most of those programs have been severely underfunded.

If we are going to hold the agricultural community accountable for making changes in their farming practices to enhance environmental quality, we must be prepared to follow through with the necessary financial support. In the near future, the Congress will address issues of soil and water quality legislatively through the reauthorization of the Clean Water Act, the restructuring of USDA's conservation programs, and preparation for the 1995 farm bill.

All of us realize that agriculture has an important role to play in maintaining and improving water quality in watersheds affected by farming operations. However, today's farmers face a lot of constraints—weather, unpredictable markets, low prices, increasing input costs, and changing governmental policies. I believe most farmers truly want to be good stewards of their land. They recognize that the future of their livelihood depends upon maintaining and improving the natural resources on their farms.

Therefore, we must ensure that any legislation we pass will promote a cleaner environment without detracting from the economic stability of farm operations. We need to identify and support creative ways to help farmers protect our natural resources.

As this subcommittee is also involved with agricultural research issues, I am very interested in the research initiatives discussed in this report. How should USDA tailor its research priorities to provide the scientific information needed to achieve advances in soil and water quality? Are there or should there be channels through which EPA and USDA can work together on these research initiatives?

The soil and water quality issues outlined in this report ultimately affect each and every American citizen, farmers and urban dwellers alike. These issues transcend the jurisdiction of any single Federal department or agency. Therefore, we simply must proceed to solve these problems with a spirit of cooperation and I will anxiously await USDA and EPA's reports on their efforts to work together in this regard.

This afternoon I am pleased to welcome three witnesses. They are Dr. Sandra Batie, who chaired the committee on Long-range Soil and Water Conservation that wrote the report; Mr. Paul Johnson, the new Chief of the Soil Conservation Service of USDA; and

Mr. Bob Wayland, the Director of the Office of Wetlands, Oceans, and Watersheds in EPA.

I thank all of our witnesses for their willingness to come to testify before this subcommittee today. In addition, written testimony has been solicited from 30 organizations representing commodity groups, farm organizations, conservation and environmental interests, sustainable agriculture, and the research community. I appreciate the efforts of all of those who presented written testimony, and I would request that the record remain open for 30 days to allow us to receive any remaining written testimony.

At this time, let me officially welcome all of our guests and, Dr. Batie, let me begin with you.

STATEMENT OF DR. SANDRA S. BATIE, ELTON R. SMITH PROFESSOR IN FOOD AND AGRICULTURAL POLICY, AGRICULTURAL ECONOMICS DEPARTMENT, MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN AND CHAIR OF THE COMMITTEE ON LONG-RANGE SOIL AND WATER CONSERVATION, BOARD ON AGRICULTURE, NATIONAL RESEARCH COUNCIL; ACCOMPANIED BY CRAIG COX, SENIOR STAFF OFFICER, BOARD ON AGRICULTURE, NATIONAL RESEARCH COUNCIL, WASHINGTON, DC.

Dr. BATIE. Thank you, Senator Daschle. I appreciate the opportunity to address this hearing and report on the recent National Research Council report on Soil and Water Quality: An Agenda for Agriculture. I will keep my formal comments brief and will not follow my written testimony exactly, but I will highlight some of the report's main points. I will discuss the committee's conclusions and recommendations. If I have a personal view that is not incorporated in the report, I will identify it as such.

There are four major contributions of the report to the policy debate and future research efforts: the examination of the linkages between soil quality and water quality; the identification of opportunities to improve both farm profitability and environmental quality; the emphasis on farming systems as a basis for program design and delivery; and the potential payoff from the targeting of programs and technical assistance to both problem areas, and problem farms within these areas.

These major themes are repeated throughout the report, as well as throughout my written testimony.

The major conclusions of the report involve opportunities to improve soil and water quality, the obstacles to change that interfere with these opportunities, targeting of programs to problem areas and problem farms, and using the farm system approach.

First, let me address opportunities to improve soil and water quality. We felt that the data available to the committee on soil degradation and water pollution were sufficient to validate the public concern with these issues. However, the data were not sufficient to set priorities based on the extent of damages. Thus, the committee focused attention on strategies which would refine the management of farming systems to protect soil and water quality with as little impact as possible on farm profitability. In the report, we relied on the science and data available to us. We

organized the report around four major opportunities to improve soil and water quality.

These are conserving and enhancing soil quality; increasing input use efficiencies; increasing resistance of the landscape to erosion and runoff; and creating field and landscape buffers. In the interest of time, I will not detail what is meant by those opportunities, but would be pleased to answer questions.

The committee found that there were many technical and management methods that exist to take advantage of these four opportunities; some even enabled producers to enhance their profitability while protecting the environment. This conclusion focused committee attention on which the question: "Why are not more of these practices and technologies being implemented through a wider part of agriculture?".

Here the committee did not find as much research as would have been desirable. The inadequacy of studies on why farmers make the choices they do, as well as the diversity of American agriculture, means that it is difficult to pinpoint the precise effect of alternative policies, on the ultimate choices of producers.

The committee concluded, however, that we did have enough of a general understanding of factors that influenced producer choices and decisions to begin to develop the report's agenda for agriculture. We identified one barrier to change as agricultural policy and we made some recommendations in that area. However, the committee noted strongly that long-term protection of soil and water quality should be based on policies and programs that are independent of price support, supply controls or income support mechanisms.

The committee further recommended that programs be targeted both to problem areas, and problem farms. As a Nation, we have not done much targeting of soil and water conservation programs through most of their history. The failure to target may have been understandable and defensible in the past. But the committee noted that now, with the availability of new data sets, models and improved scientific understanding, we are better able to identify the location of both problem areas and problems farms within those problem areas.

I want to emphasize that the committee felt strongly that targeting critical watersheds may not be enough. The committee also recommended the targeting of programs to problem farms, within a problem watershed area. This additional targeting has the advantage of not penalizing the good steward. In addition, targeting problem farms direct limited resources to where the problems exist.

The committee recognized that we do not have all the data to target with a high degree of refinement, but there are solid beginnings. The committee recommended research to improve our understanding of the linkages between the natural resource quality, the production practices, and producer choices.

The committee recognized the importance of focusing research and policy on those linkages within a production system. Given the data and information that are now available, the committee assumed that much policy will be based on technology based standards rather than the actual impact on the water or soil quality

(that is, on performance criteria). Such will probably be the case until research better identifies these linkages.

The committee recommended, if that is the case, then excellent recordkeeping will be absolutely essential as a basis for integrated farm plans. Good recordkeeping can mean improvements in soil and water quality and improved profitability.

The committee had less to say about funding. We recognize that funding is an important issue. The committee noted that targeting would help conserve resources. The committee made a few recommendations on investigating the possibility of some minor taxes on inputs and the earmarking of these funds for nonpoint pollution control programs.

Let me conclude by saying that I had an excellent committee of experts who took considerable time and effort and volunteered their time to produce this report. In addition, NRC project director who is here with me today, Mr. Craig Cox, was critical in this report's excellence and timely publication. The subcommittee has asked Mr. Cox to attend this hearing today because the report was followed by a series of round tables, some of which have been completed. Mr. Cox has submitted written testimony on the outcome of those round tables across the Nation and is ready to answer questions on them at the conclusion of the formal testimony.

Within the report, the committee used the scientific information that we had available as well as our knowledge of soil and water quality to help frame the policy debate in a more meaningful way. I feel our report has been very successful in meeting these objectives, and I welcome your questions. Thank you.

Senator DASCHLE. Dr. Batie, thank you for an excellent opening statement. Let me welcome Mr. Cox. I did not call attention to the fact that he was accompanying you and I would ask with his consent that his testimony be made part of the record.

Mr. COX. Thank you, Senator.

Senator DASCHLE. Let me call on my colleague, Senator Harkin for the introduction of our next witness.

STATEMENT OF HON. TOM HARKIN, A U.S. SENATOR FROM IOWA

Senator HARKIN. Thank you very much, Mr. Chairman. I apologize for not being here. I was held up in my office for some meetings, but I do want to see your testimony and again I appreciate all the work that you have done in this committee on these issues.

Mr. Chairman, Paul Johnson, the new Chief of the Soil Conservation Service has been a long time leader in these efforts on soil and water quality. We are, of course, very proud of him in Iowa. He is a long time friend of mine. As our new chief in the Soil Conservation Service, he is now in a good position to have a great influence on the national policies on soil and water quality. As a member of the Iowa legislature, Mr. Johnson authored Iowa's landmark Groundwater Protection Act which serves as a model for legislation in other States and at the national level. Mr. Johnson has been a pathfinder in raising our awareness and in developing many issues and ideas that remain at the heart of the discussions on agriculture and environmental matters. I am glad he is now the head of the Soil Conservation Service.

Let me just say, Mr. Chairman, that I thank you for holding these hearings. It is most important issue; one that is going to confront us even stronger in the next few years as the CRP land starts to come out and we develop our 1995 farm bill. I am glad the focus seems to be now on the practical considerations that come into play. Obviously, farmers are limited in carrying out soil and water conservation practices that cost them money, either because it takes land out that they need or it costs them some up-front money. So we have to look at ingenious new ways at which we can get farmers to do voluntarily those things that are better for soil and water and which will also not impinge on their incomes.

The water quality incentives program that was included in the 1990 farm bill, I believe, has done that. It was based on a pilot program, as a matter of fact, that Mr. Johnson is well aware of that he was instrumental in starting in the State of Iowa. The basic idea is to give farmers incentives, to encourage them to adopt management practices and systems that improve profitability and environmental quality through more efficient use of pesticides, fertilizers, animal wastes and inputs. I believe the water quality incentive program has worked. I do not know that we have funded it as well as we should, but I would be interested in knowing any views or any thoughts that you, Dr. Batie, or any others have on the water quality incentive program and how it has worked and any possibility for enhancing it or changing it as we move ahead.

So again with that, Mr. Chairman, thanks for holding this hearing and again I am delighted to introduce Paul Johnson, the new head of the Soil Conversation Service.

Senator DASCHLE. Thank you, Senator Harkin. Before we call on Mr. Johnson and I would note for the record that he is accompanied by Dr. Richard Arnold who is the Director of the Soil Survey of the Soil Conservation Service. Let me call on our ranking member, the Senator from Idaho, Larry Craig for any opening remarks that he might make.

STATEMENT OF HON. LARRY E. CRAIG, A U.S. SENATOR FROM IDAHO

Senator CRAIG. Mr. Chairman, I will be brief because I think it is important we get to our witnesses today, and to the issue at hand. Let me thank you for holding this hearing as it relates to the National Research Council and what they have produced. I have been able to read at least the preface and the executive summary of it, and I think all of us agree that this is an issue that is front and center. It is at the heart of our ability to continue to remain productive agriculturally in this country.

Our resources, be they water or soil or air, are very dependent upon wise and proper use. We here can at least set standards or participate in encouraging the proper things to happen. We have done that over the years and we are continuing to do so, whether it is Soil Conservation, USDA, or Clean Water legislation.

In my State of Idaho, we have a combination of both an irrigated agriculture in the south end of the State, and a naturally irrigated agriculture in the north end of the State. We are all concerned about the nature and the state of our soil. A lot is going on out there.

I am concerned when I see in some of the comments that legislation and efforts should move us toward mandatory enforcement. There is, I believe, an inference in the book that we might need to move towards some nonvoluntary efforts. I grow increasingly concerned when I think about infringement upon certain private property activities without a cooperative encouraging kind of effort. A Federal law that says "thou shall" is always of concern to me and it is always of concern to my agricultural people. We must work in a cooperative nature, instead of a nature of enforcement and restriction.

I do not think that has ever served us very well, especially in production agriculture. I do not think it ever will because some of our best conservationists are our farmers, properly educated and assisted. So with that in mind, Mr. Chairman, again thank you. I look forward to the testimony. Let me listen to the witnesses.

Senator DASCHLE. Thank you, Senator Craig.

[The prepared statement of Senator Craig follows:]

STATEMENT OF SENATOR CRAIG

Mr. Chairman, thank you very much for scheduling this hearing. We have water and soil issues, critical to agriculture, regularly coming before the Senate. It is likely this coming session will be no exception. The recent report from the National Research Council on Soil and Water Quality, provides this committee an excellent opportunity to review the many aspects of these complex issues, and how they can do, and will affect agricultural production in the United States. As indicated by the National Research Council, the list of environmental problems, on the agricultural agenda, has grown in the past few years.

Mr. Chairman, as stated on page one of the referenced book, "The United States economy, and the livelihood of citizens, depend on soil, water, air, plants, animals, natural and managed ecosystems, as fundamental resources. Agricultural production, by its very nature, has pervasive effects on all these resources."

The national debate on this issue, has intensified, and will continue to sharpen. The book also points out that we face trade-offs in dealing with these questions. We must improve agriculture's environmental performance while reducing costs of production, and maintaining our share of the domestic and world markets.

Dr. Batie, I welcome you to the committee, and look forward to your application of the details in the book, the "Rest of the Story", as Paul Harvey would say.

Dr. Batie, I was particularly interested in your preface statement that "A great deal of progress could be made, even in the absence of new legislation, by integrating the multitude of Federal, State, and local programs that are already addressing pieces of the soil and water quality problem. The opportunities to make current programs more effective are great and, in many cases, the authorities needed are already provided by legislation.". As we face the Clean Water Act Reauthorization, and then the 1995 Farm Bill, I would be interested in the comments of all the witnesses on the statement of Dr. Batie.

As stated in this report: "opportunities vary from region to region, crop to crop, and farm enterprise to farm enterprise that will protect our national soil resources; many producers have already made substantial improvements in their farming systems; much greater progress could be made, if producers had better tools, and information to refine the management of their farming systems".

As we search for methods to improve our environment, while maintaining our productive capacity, we must be cautious regarding the methodology used to influence or mandate producers' decisions. I'm more than just concerned, Mr. Chairman, when I hear statements such as "nonvoluntary approaches will be needed to provide more permanent protection." How far can we go toward "nonvoluntary" efforts before we infringe legitimate private property rights and responsibilities?

I look forward to discussing with the witnesses the report of the National Research Council. I will have additional questions for the witnesses.

Thank you, Mr. Chairman.

Mr. DASCHLE. Mr. Johnson, welcome.

STATEMENT OF PAUL W. JOHNSON, CHIEF, SOIL CONSERVATION SERVICE, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, DC., ACCOMPANIED BY RICHARD W. ARNOLD, DIRECTOR, SOIL SURVEY DIVISION, SOIL CONSERVATION SERVICE, WASHINGTON, DC.

Mr. JOHNSON. Thank you. Mr. Chairman, Senator Harkin, Senator Craig, it is good to be here. This is my first such hearing and I cannot think of a better place to start. There is no issue that is more important to me than the care of our natural resources and particularly on our private lands. As you know, the Soil Conservation Service is charged with dealing with those issues. There is no better place to be at this time.

Thank you for the opportunity to discuss the National Research Council's report on Soil and Water Quality. I have a full written statement for your consideration, but I would like to take these few minutes to highlight what I believe is the essence of the report. In so doing, I want to emphasize that the issues raised by the report, and how we choose to deal with them, will have enormous consequences for our agricultural systems, future food supply, and sustained environmental quality.

I consider this report important for many reasons, but let me cite just three. First of all is its focus on soil quality. It is one of the most critical pieces of the environmental puzzle. We have talked a great deal about water and we have talked a great deal about air, and I think for the first time, we have between the covers of the National Academy of Sciences report, the issue of soil as more than just sands, silts, and clays, but also a report dealing with the functions of soil and the need for soil quality to be maintained.

Second is the Council's premise that preventing environmental problems is better than cleaning up problems. We talk a lot about this and I think it is really highlighted in this report.

Third is the recognition that we can keep our agriculture profitable and productive and still meet the needs of our society and sustain our environment. I believe this is very important and I think this report made that very clear. I am pleased with the Council's optimism about the technology and the people on the land; that despite all the work yet to be done, there is good and effective conservation going on on the ground through voluntary, locally driven stewardship, and that agriculture should be confident with its overall track record in adopting science and technology.

I am also pleased with the Council's willingness to look at soil quality, water quality and related environmental issues, not only as scientists, but also as human beings. People are, after all, part of the landscape. In all, the Council's findings make us feel that we are on the right track with steps taken by the Soil Conservation Service over the past 2 or 3 years.

It is interesting as you look back in history that we started back in 1933 with the Soil Erosion Service and our first efforts were in watersheds and in a very holistic approach to dealing with these issues. Here we are again in 1993 talking pretty much the same issues. We want to build on that effort.

As the report indicates, we cannot do it all. We must target regionally and locally on the pertinent problems and most critical problem areas. We must look at the landscape more holistically

than we have in the recent past in terms of integrated, sustainable farming systems. We can do a better job of utilizing the technology already at hand, and one of the issues that Sandra mentioned was the buffer zone concept. We feel that that is a very important concept and should be part of our future planning process.

We can do more in terms of building partnerships and alliances that benefit education and technology transfer. As we know, we cannot do it alone and certainly the Soil Conservation Service cannot do it alone. We have done it in partnership for many years and we look forward to building new partnerships and new alliances to get the job done. Overall the report is a scientific and common sense blueprint we can use, especially as we address the reauthorization of the Clean Water Act and develop the 1995 farm bill.

As a farmer, former State legislator, Chief of the Soil Conservation Service, and a father of three children who will inherit a piece of this earth, I encourage us all to heed this report's contribution to the art and science of living on the land in a sustainable way. Thank you and I look forward to the time of questioning.

Senator DASCHLE. Thank you, Mr. Johnson. I can tell that you attended hearings in the past and know from experience that the shorter the better.

Mr. Robert Wayland is the Director, as I indicated, of the Office of Wetlands, Oceans, and Watersheds of EPA, and he is accompanied today by Geoffrey Grubbs, the Director of the Assessment and Watersheds Protection Division. Gentlemen, we are pleased you could be with us. Mr. Wayland, we encourage you to proceed at this time.

STATEMENT OF ROBERT H. WAYLAND, DIRECTOR, OFFICE OF WETLANDS, OCEANS, AND WATERSHEDS, ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC.; ACCOMPANIED BY GEOFFREY GRUBBS, DIRECTOR, ASSESSMENT AND WATERSHEDS PROTECTION DIVISION, ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC.

Mr. WAYLAND. Thank you, Mr. Chairman. We at EPA are pleased to be here and to commend the National Research Council's Board on Agriculture for producing this timely and excellent report. It was written and reviewed by some of the country's most widely respected experts in the fields of agriculture, soil science, and water quality. The compilation and review of available information that the NRC undertook, together with their cogently reasoned recommendations, have combined to produce a volume that can be fully expected to play an important and highly influential role in all future discussions of these important issues for many years to come.

The report arrives at a time when the interdependence of agriculture, soil, and water quality are becoming increasingly recognized, if not yet fully understood. For example, in the area of water quality, beginning in 1972, Congress directed EPA and the States to focus both regulatory attention and huge financial resources upon point-source discharges, such as those from factories and sewage treatment plants. As a result, we have made great strides in cleaning up discharges.

Today, after more than 20 years of Clean Water Act implementation, we find that the major remaining types of pollution are from nonpoint-sources. The most dominant and widespread nonpoint-source category of concern is agriculture and the most dominant pollutants responsible for remaining water quality pollution problems in the U.S. are sediments and nutrients—both of which are attributable to a significant degree from agricultural runoff.

State water quality agencies report that agriculture affects about two-thirds of all impaired river miles and contributes to about one-half of all impaired lake acres. USDA's second Resource Conservation Act appraisal of conditions and trends on non-Federal lands reported that agricultural nonpoint-source pollution degrades water quality in about 30 percent of all streams. Some studies have also documented that agricultural nonpoint-source pollution affects ground water as well.

In light of this and other corroborating information detailed in this report, the National Research Council recommends a 4-point agenda that, if implemented, would make great strides in protecting and restoring soil and water quality, and Dr. Batie has outlined these four important points with which EPA is in full agreement.

Indeed, much of our nonpoint-source program for reducing agricultural pollution of our waterways centers on achieving these goals. I would like to note briefly some of the programs and activities that Federal, State, and local agencies are undertaking to achieve these goals, as well as to indicate potential future directions for improving our Nation's water quality efforts.

Our primary program for dealing with the relationship between agriculture and water quality is the nonpoint-source program established in the 1987 Clean Water Act's Section 319. Under this program, each State developed an assessment report that summarizes available information on the source categories and locations of nonpoint-source pollution in the State. Each State then developed a nonpoint-source management program designed to address those sources. The State programs addressed the sources through a variety of means, including technical and financial assistance, demonstration projects, information and education, and regulatory approaches.

EPA has approved all of the State management programs, which were developed with a great deal of involvement by members of the agricultural community, including USDA, State soil and water conservation agencies, local conservation districts, and citizens. They drew heavily upon existing Federal, State, and local programs and funding sources, while ensuring a specific focus on water quality aspects of those programs.

In fiscal years 1990 through 1994, Congress has appropriated $270 million for States to implement their nonpoint-source management programs, and at least one bright spot on the upcoming budget will be a further increase in nonpoint-source pollution funds. At least half of the funds appropriated to date have been spent to support programs and projects that address agricultural sources. In implementing these projects, it is important that we acknowledge the critical role played by USDA's agencies, especially its field personnel, as well as by numerous State conservation staff and local conservation districts in implementing programs and

projects. Certainly, Paul Johnson needs to know and I believe he did before he arrived in his new post, that we have enjoyed a very successful partnership with the Soil Conservation Service, both at our headquarter's level and at the field level.

It is especially gratifying to see that in most cases, our 319 grant funds have been combined with funds from USDA, other agencies, and private citizens to implement jointly managed projects. State nonpoint-source programs have contributed staff and funding assistance to many projects that have been supported by USDA as part of its water quality initiative.

It is significant to note that most agricultural programs and projects addressed by Section 319 address those concerns identified as priorities in the NRC report: nutrient management, including fertilizer application and manure management; pest management, including the promotion and demonstration of integrated pest management practices; irrigation management; erosion control; and riparian buffers. It is equally significant that many of these measures can be implemented in a cost-effective manner, indeed in some cases, realizing cost savings to the producer from reduced inputs that can offset the cost of implementing measures to protect water quality.

We believe that by working together cooperatively with agricultural producers, EPA and USDA can make significant progress in effectuating the goals of the report and reducing nonpoint-source pollution in a manner that is compatible with the continued economic vitality of American agriculture.

I think I will stop at this point, Mr. Chairman. My prepared remarks identify a number of successful examples of specific projects implemented on the ground that I believe bear out the generally positive view we take of the report and the contribution that it can make. As you and your colleagues have acknowledged, the upcoming reauthorization of the Clean Water Act affords us an opportunity to take another significant step forward in implementing the recommendations. We look forward to working with the authors of the report and our colleagues at USDA to realize that opportunity. Thank you very much.

Senator DASCHLE. Thank you, Mr. Wayland, for your comments. Dr. Batie, let me just again, because I said at the beginning, tell you how appreciative many of us are of the work that the committee has done in producing what really is one of the most thorough reports, I think, we have seen in recent years at least. As Mr. Wayland has just indicated, it certainly is on target in emphasizing the importance of soil quality and advocating the systems approach to soil and water quality problems. I think we acknowledge that up front.

There are some concerns, and certainly Senator Craig addressed one of them, that I want to begin discussing right at the beginning, and they have to do with the recommendations which will affect farmers, and in particular many farmers who have already made efforts to improve their farming practices in environmentally responsible ways. The report, as you indicated, recommends a combination of voluntary and nonvoluntary approaches. Farmers have a lot of problems with the idea of mandated practices and a

regulatory approach. What kind of regulations does the committee have in mind?

Dr. BATIE. Let me start by emphasizing that the committee emphasized using incentives to influence producer behavior. Several of the ideas, within the report are of a non-mandatory nature and are worth highlighting here. Let me reemphasize the idea of targeting programs to where the nonpoint pollution problem exists. In the past, programs have not done as good a job as can be done to target educational programs to these producers in a way that responds to the particular producer's constraints.

Programs have had a "broad brush approach", historically. Farmers have been asked to show up at a meeting, to discuss nonpoint pollution problems. What the committee recommended is a targeted educational programs where certain producers, in certain watersheds, that are targeted for tailored, educational programs that recognize the producer's constraints.

One of the contributions of the report is the statement that business as usual has not been as successful as might be desirable. Instead of business as usual, we should redesign our educational programs, and emphasize market-based incentives. The committee did continue, however, noting that there may be circumstances where these voluntary programs are not going to achieve the desired water quality. In these cases, if we are going to achieve water quality goals, there may need to be more regulatory approaches.

The committee did not take a position as to whether some there should be a compensated regulatory approach. It did not recognize that a totally voluntary approach may not get all watersheds to the level of water quality that may be deemed desirable by the Congress.

Senator DASCHLE. Could you be more specific as to where you anticipate the nonvoluntary, regulatory approach if that may be necessary? Did you anticipate those particular areas?

Dr. BATIE. I do not believe we did. We did not grabble as a committee with the level of detail as to where these particular areas would be. We viewed such identification to be a policy decision to be made by policymakers; not by a committee of scientists.

Senator DASCHLE. Did you discuss at all the punitive nature of the regulatory approach in those areas where farmers are doing all they can, where they have really been good stewards and where they are already working on improving the soil and water quality? How does one differentiate?

Dr. BATIE. One way to differentiate is to collect more information on what practices are actually being used on which landscapes and which enterprises. Most likely in the near future, programs will be based on design standards, the technology-based standards as the way to determine whether producers are doing what they can for water quality. If this is true, there is need for better collection of information, on who is implementing which type of practices. This information can differentiate which producers are actually implementing the practices that are deemed as best for improving water quality.

Senator DASCHLE. Do we have technology that allows us to pinpoint where the problems really are?

Dr. BATIE. We have a much better information than we once did. The Committee report singled out, for example, geographical information systems that can overlay sets of data to pinpoint where there are problem watersheds; what is the nature of the water quality problem; what kind of topography lies within it; which kind of production practices are being used, etc. Some of those systems in some States are much better advanced than others. If maybe Mr. Wayland could help us a little bit by discussing the monitoring that EPA has done on water quality. But my impression is much of the monitoring is still very "broad brush," so there is need to refine information systems.

Senator DASCHLE. Let me say in this subcommittee we encourage the spontaneity of participation. So we want you to jump in and I saw that Mr. Wayland was nodding his head affirmatively. Maybe you can enlighten us as well, Mr. Wayland?

Mr. WAYLAND. I think this is a good opportunity for me to note that in the guiding principles articulated back in May when Carol Browner, our administrator, testified before the Senate Environment Public and Works Committee and House Public Works and Transportation Committee. She said on this very point that voluntary approaches should remain the primary focus, but backup enforcement requirements at the State and Federal levels are needed when voluntary approaches fail to produce adequate incentives and necessary voluntary improvements. I agree completely that we need a new round of assessments by the States of their water quality. That is incorporated into the recommendations that we are making on the Clean Water Act and would be a necessary building block in strengthening State programs.

We would not see enforceable measures being applied on a farm level for really quite some years. I think that those producers who are engaged in sound stewardship and aware of the impacts of their operation on their neighbors and the water quality that is important to us all, really have relatively little to fear in terms of a heavy-handed approach being right around the corner. At the same time I think that we do need to have the notion that where water quality problems persist and efforts to reduce the sources of those problems are not successful in a period of time, we will need to be more focused and serious in our efforts to address those problems. A number of States, of course, have established enforceable for some agricultural categories, most notably, dairy and confined animal operations. Most producers potentially subject to those penalties or mandates are in compliance and will have no difficulty continuing their operations in a way that is friendly to the environment.

Senator DASCHLE. Go ahead, Mr. Johnson.

Mr. JOHNSON. If I could, I would like to add to this. We have just gone through a 9-year process from the 1985 farm bill and then the 1990 farm bill with conservation compliance on highly erodible lands. We have learned a lot from that lesson, that dry run as we can call it, I guess, as we look towards the Clean Water Act, another possibility is there. First of all, it was a massive effort to try to work with farmers to control the highly erodible lands. To a great extent, it was an educational process. Although, because it had to be done in such a short period of time with such

few resources, I think it is viewed by many as a regulatory process right now.

But I think as we look to the future, we ought to take a look at what we did in that program. In fact, I just had a meeting today with my staff to try to put in place a major evaluation of that program, because I think that we should not let the lessons of the last 10 years drop by the wayside. We really need to take a good look at that.

Senator DASCHLE. Dr. Batie, your report also advocates reforming Federal price support and supply control programs, and I read your recommendations with some interest. I am concerned that reductions in income support for farm families, particularly in certain parts of the country, may actually serve as a disincentive to environmentally-sound practices because in certain cases farmers choose to simply not participate in Federal programs. Our goal, of course, is to help producers farm both sustainably and profitably without harming their ability to make a decent living.

The question, I guess, I have is are you advocating reductions in farm income support payments to pay for programs to encourage environmentally-sound farming practices? Was that the motivation?

Dr. BATIE. The report itself did not spend a long time on reform of agricultural policy. It made a statement that we have in the past tried to ask one policy instrument to do several objectives; for example, the conservation reserve program, has been used for both supply control and for environmental improvement. Using one policy instrument for both is an ineffective way to achieve environmental quality.

You are correct when you say that farmers who are struggling with income problems are not going to be stewards. The committee did discuss, as one alternative the possibility of using some commodity program funds for "good stewardship" payments. But the committee did not proceed beyond the point identifying this as an alternative. Income is important. While not in the report, my fellow ag economists assure me that the reduction in target price and loan rates for some commodities, means that the benefits of participating in the farm programs are becoming problematic for some producers.

If we choose to pursue our environmental goals, therefore, on a cross-compliance basis, however it is designed, and if there is nothing else done to reduce the commodity programs benefits, we might see farmers opt out of the program. The programs will not be worth participation to the producers. Producers lose income and quality will not be obtain through the Farm Bill, this is a germane issue and it is one of the difficulties of using instrument to pursue two objectives.

Senator DASCHLE. Would not the CRP be an example of objectives which may be dual in nature but not conflicting necessarily? I mean, you have got a need for appropriate set aside for crop supply control purposes, but you certainly have a very viable conservation enhancement effort underway, judging from what we have seen in South Dakota. They do not necessarily appear to me to be in conflict.

Dr. BATIE. I do not disagree with that. I do not think you will find most people disagreeing with the statement that the CRP has brought many environmental benefits. It has certainly added income to quite a few counties.

Senator DASCHLE. You say they argue that it has not brought many?

Dr. BATIE. No, that it has. It has been successful. There are some tradeoffs. There are not as many environmental quality benefits gained as if the programs had been targeted to those lands specifically selected because of wind, air, water, or soil problems. The lands that we need to take out of production get the most supply control are not always the ones contributing to environmental problems.

But beyond that assertation, the program has achieved some of the dual objectives. The difficulty comes now that the CRP contracts are expiring; are we going to lose those environmental benefits; are those lands going to be back in production? This issue was underlying, what the committee wrote in the CRP topic. That is there were concerns about the lack of permanence of this type of approach.

Senator DASCHLE. Senator Harkin?

Senator HARKIN. Thank you very much, Mr. Chairman. Following up on that point on the CRP land coming out, everyone is scratching their heads trying to figure out what to do and to get suggestions from all across the board on what we are going to do with this land. Again, you pointed out correctly that a lot of the land in CRP does not really seriously threaten a degradation of soil and water quality, because we have so much in each county. So we have got fairly flat counties in Iowa that have land in the CRP, but in other parts of the country we should probably have some more land in CRP that is not in it because there were limits in each county.

In those hilly areas, when those lands start coming out in 1996, several million acres about 50 percent come out in 1996, if I am not mistaken?

Dr. BATIE. I do not actually know those exact numbers.

Senator HARKIN. Something like that.

Mr. JOHNSON. About 2 million in 1996. The first out is a little over 2 million acres, I believe, the first year.

Senator HARKIN. They must really bloom up the second?

Mr. JOHNSON. Yes, it goes up pretty fast.

Senator HARKIN. What I want to ask, does your work envision anything like new crop production systems for this CRP land? In other words, ways to get economic return from those lands while protecting soil and water quality, such as livestock production or energy crop production and that type of thing that could be done on those CRP acres? Have you looked at anything like that in your report regarding possibilities for CRP land?

Dr. BATIE. We did not.

Mr. COX. Mr. Chairman, Senator Harkin, I am Craig Cox, Project Director for the study on soil and water quality. To one extent, the committee envisioned—felt that producers were given sort of extreme choices in the CRP program. You had to either take your land totally out of economic production or it had to remain in

production and you had to pay the cost of environmental improvement. The Committee envisioned conservation easements or contracts that would allow certain uses of the land. In other words, buy some of the rights to farm the land. For example, for row crops, but allow continued production of close-grown crops, forages, so on and so forth. They felt that that sort of approach, offering that approach for producers as the contracts end, might gain more of the environmental benefits you are looking for at a lower cost.

Dr. BATIE. My apologies for overlooking the point. That particular section of the report, however, was broader than CRP lands. The committee was addressing the need to identify problem areas and whether or not they were in CRP by considering long-term easements as one way of achieving these goals. Easements mean that some rights can be left in place, so that there was still some economic returns. But the report itself was not totally focused at CRP. It could be lands that were not in the program at all.

Senator HARKIN. That is what I said about the practical solutions here because take a farmer in southern Iowa that has land in CRP. Let us say the average for that class of land is about $72 to $75, $72 an acre I think it is, something like that. That is a steady income coming in and that is quite an economic impact in an area, in a county area. We have got to figure out how we are going to replace that. You just cannot drop that off the boards. There has to be an economic return. Here we are in 1994, two and a half years away, and I do not know if we have anything in place to do that. I just would hope again that perhaps using some of the data and some of the findings you had there, you might point us in some direction on what we might do with this land.

You are right, it is not all homogenous. In some areas you can farm it. You can put buffer strips around it and all that and it is fine. You can limit the fertilizer. You can limit tillage and so forth. But some of it you cannot. Some of it is just very high erodible. We have to figure out what we are going to do with those lands concerning soil and water quality.

Dr. BATIE. The committee did have an extensive section on the use of easements in the report. We took some time to try and lay out those options in a little bit more detail.

Senator HARKIN. There are some interesting things going on around in the country. People experimenting with different practices in CRP land.

Senator DASCHLE. The subcommittee will be doing some hearings on this very issue. We want to get out of Washington to do some of them.

Dr. BATIE. We emphasized in the report some of the payback from these creative partnerships. They are difficult to do, but a lot of really success stories come from local efforts—the coalition building and partnerships. Mr. Cox can elaborate on these efforts drawing from the round tables that he chaired. But it seems like some of the elements of success for partnership are, recognizing that there is a problem; a recognition that there will be some public response to the problem; and, some blessings from a fairly high level, for example, in a State, it might be from the Governor.

But within that context you see some of these creative partnerships of agencies getting together with producers, growers, with en-

vironmental community and making some difference in certain watersheds. Certainly, I think, your suggestion of having hearings outside of Washington, DC., is an excellent chance to identify some of these more successful partnerships and contemplate how, as a public body, you can encourage more of these to happen. They are a lot more complex than when the only focus was on soil erosion.

Mr. JOHNSON. The report talks a great deal about buffer zones and it seems to me that the CRP could function very well there and some of our later sign-ups in CRP did talk about that, especially repairing buffer strips and things like that. But as we look to the future on this, field boarders, reparian in areas, waterways and things like that, we can get an awful lot of conservation on the ground for relatively little money compared to the total CRP program if we take a look at that in the future.

Senator HARKIN. I have taken enough time. Thank you very much, Mr. Chairman.

Senator DASCHLE. Senator Craig?

Senator CRAIG. Mr. Chairman, thank you. Mr. Johnson and Dr. Batie, let me go back to the buffer zone issue for a moment. I noticed that one of your four recommendations dealt with field and landscape buffers, and the opportunity that exists there. There is also a potential problem that exists, depending on how buffer zones are designed and/or handled. Let me propose a question and then cite an example as to how it might frustrate management and productivity.

First of all, I think, Mr. Chairman, we all recognize there is a micro and a macro issue here. Certainly the macro issue is 10 percent of the disposable income in America, or somewhere in that figure, is spent for food. Whatever we do, if not careful, drives those costs up. We can create some unique and very real factors in the marketplace for the average citizen. We must recognize that food and fiber production does alter the environment, does have impact on water and soil quality, as your report clearly spells out.

Now the buffer issue. The question is, are we talking about a no activities kind of buffer or a different activities kind of buffer? Let me make myself a little more clear. In the State of Idaho right now, we are examining something that, I think, dramatizes what buffers can do and what they cannot do or might do differently than we would suspect. We have endangered fish in the Snake and the Columbia Rivers and that is the Salmon. The National Marine and Fisheries, working with the Forest Service and the BLM, has proposed a 300-foot buffer on each side of streams on public lands in certain areas to protect the riparian zones and water quality. Initial blush, that sounds like a reasonable and responsible approach. Those lands happen to primarily fall on timbered U.S. Forest Service lands.

When you examine it, all of a sudden that one decision knocks out 35 percent of the timber base in the State of Idaho—gone—from that area studies and planning that we said is current and future timber base for the fiber of our country. So what do we do? Obviously, all of the great planning and designing we have done up till now is out the window or has to be dramatically altered. Communities, many highly dependent upon timber and struggling with current shortfalls in timber base, just got another 35 percent taken

away from them or proposed to be taken away. All for the right reasons. None of us dispute that.

But what that decision did, in my opinion, and we are now pursuing that, is that it ignored modern practices. It basically just said, the only way you could protect those riparian zones is in a no activity environment. Create the buffers, stop the activity, 35 percent of the timber base is gone. Working with some of the Forest Service people, we realize that the activity can be changed and still have a reasonably productive timber zone, depending on new technologies and new approaches. We then may lose 15 percent or 10 percent of the timber base.

Now on agricultural land, we also know that our most productive land is probably down next to those streams. There is a natural movement of soils and erosion and sedimentation. We know this is where the rich soils are located. We also know from set aside problems, CRP, farmers are not dumb. They put their least productive land in and they kept their most productive land out. So, we now begin to leverage and put buffers in and around those. Let us say on the average farm in Idaho or Iowa or the Dakotas, we did a buffer zone effect and it took out 35 percent of the current production base. What does that do to production agriculture in this country?

So back to the question. When we talk buffer zones, are we talking no activity landscape zones or are we talking a different activity that allows those zones to remain relatively productive. We must recognize the need for the buffering end or the protection of a riparian area, *i.e.*, water quality and all of those types of issues while maintaining productivity.

Dr. BATIE. Let me speak just briefly on agriculture. I cannot address the forest use of buffer? In order for a buffer strip to work in agriculture, it has to be managed. If it is not managed, it ceases to act as a filtering device. Without management, it ceases to filter some of the things out of the system you want.

I do not know how wide the buffer would have to be exactly. There is some research that suggests, you do not have to have 100 feet unless you have got some real steep topography. It could be a lot less than that. But I think we need some more research in this area of the optimal distance to the water of a buffer.

But let me stray from the report for a minute and just tell you about Michigan. A Michigan farmer that I talked to did not put his land in CRP, but he did put it in a buffer strip. That is, put his set aside in a buffer strip. Now he stands to lose the set aside and he needs to put it back in to base. He was very upset because he is a good steward. He is protecting the Great Lakes. He chose to do it with a set aside and now he feels that the pressures of the farm program and the way it was designed and implemented means that he has to plow out what he thinks is an active buffer.

There are these type of opportunities that we need to think more intelligently about, so that a good Michigan steward does have some avenue to keep that buffer strip.

Senator DASCHLE. That is why right now you are thinking about the TOP program. The Administration has a decision to make about the TOP program. What better opportunity to give a farmer

an incentive to set aside and create those buffers with a little higher income.

Dr. BATIE. As an economist, I recognize that people respond to incentives. There are feelings about stewardship there that could be taken advantage of and better enabled. Part of what the committee tried to do, in this report, was to take advantage of some of the stewardship desires. All through the report are peppered ideas on using incentives, but we ought not assume that a farmer will not attempt to protect the environment, if there is an opportunity to do so.

Senator CRAIG. Mr. Chairman, you covered a couple of the other issues that I am concerned about. How we achieve compliance if we constantly tie compliance to so many of our farm programs that the tradeoffs become so expensive they opt out. Some just simply say, we will go to the market alone because we cannot afford the requirements of compliance. That becomes a real factor.

Also, if we are dealing with mandates or very specific requirements that cost money, I think all of us recognize that something else besides these tools have used in the past—Soil Conservation Service Programs obviously—will work up to a point, but they do have impacts on governments. You spoke to it well, Senator Daschle. I am talking local governments, local communities in changes of economics that I would be extremely concerned about as it relates to that.

How do we establish then realistic best management practices? Who is going to establish that? What are the guidelines going to be? What is best management and where is best management? Who would like to respond to that?

Dr. BATIE. Let me just highlight something the report emphasizes. The committee recommends that we should move away from the language of best management practices to best management systems. The committee recommended thinking about the farm enterprise as a whole system and its interaction with the environment; therefore, simply thinking about best management practices is not the best way to proceed. It can lead us astray, it can hurt profitability, and it can hurt the environment, as opposed to looking at a systems approach.

Senator GRASSLEY. Because it does not fit every farm the same, is that the reason?

Dr. BATIE. Or because there are tradeoffs. Focusing on only one part of the farm may indirectly lead to impacting another part of the environment. For example, there may be increased leaching to ground water by stopping the surface runoff, if you do not think about the farm as a system. You may be foregoing the opportunity to use manure on the farm as fertilizer if there is livestock and crops unless the farmer takes credit taking credit for the manure and reduces commercial fertilizers, for example.

In the report, there is a small sidebox discussing how farms can be thought of as integrated systems and how the farm system approach can be used. I also believe and actually the report mentions as well, that the systems approach is a coordinating mechanism for agencies, be they State, local or Federal. The agencies can to come together and ask, what should an integrated farm plan look like? Which farms are we talking about? What kind of integrated farm

plan will we use to decide who are the good stewards and who are not? It is a coordinating mechanism for the many policy actors that are now all trying to influence the agriculture sector.

How do we coordinate them so that farmers do not have to deal with all kinds of plans for all kinds of reasons? Can we not use an integrated farm plan? EPA, USDA, State, and local agencies are thinking about this approach, in order that there be is a single plan that thinks about the farm as a system, as our delivery mechanism, as our educational mechanism, and as our targeting mechanism.

Senator CRAIG. Mr. Chairman, maybe one last question because I think when you talk of systems or best management systems versus practices, I have been working with other agencies in talking about ecosystem management. It does make some sense and I will not dispute that. What does concern me though is how you measure the effects or the results. This is especially true in a farming environment inside the mosaic of a farming community within the larger total system. Do we attempt to measure or how do we judge the result of the piece versus the result of the whole? I am talking of the cumulative impact? In the downstream water quality, do we pit one farmer against another? If you do you are going to create war out there on the landscape that says, well I am doing it the way that you want it, but so and so upstream is not, so you are penalizing me and making me perform better. How do we marry that whole relationship together if we are talking systems? How do we analyze best management systems versus best management practices? We have got to get beyond the system of the farm, I would think, to the system of the whole if we are really going to have the kind of impact that your study is overviewing and recommending.

Dr. BATIE. I agree with what you are saying. I think there are two levels that we approach this issue in the report. One of which is to identify where the problems exist, whether they are water quality problems or soil quality problems. Within that identification then there is need to the owners of the lands that are the major contributors. Then the committee suggested the major contributors have an integrated farm plan, based on a systems approach as a sensible way to address the issue.

What the report did not say, is how to decide what is enough. Because the data that we would like to have that links these systems to ultimate water quality is not complete, there will probably be a policy that states of a producer has implemented the integrated farm plan, then he or she has what was called for. There are my own comments and not the committee's. It is a large research effort to link those systems changes to water and soil quality changes.

But my professional opinion is we are not there yet. Therefore, my professional opinion is that it would be unfair to penalize a farmer because the local watershed still is not clean, if the farmer, in good faith, is working with agencies' implemented, integrated farm plan. In some ways, it can be thought of as following label directions. If the producer did what experts suggested, then that should be sufficient. The report, I want to reiterate, did not discuss this issue.

There is a need to improve our understanding of those linkages. I believe that is what Mr. Wayland was stating—that EPA is of the same mind; we are not at that point—to definitely link water and soil quality changes with changes in production practices.

Mr. WAYLAND. I think that is absolutely true and we need to take an iterative process where we adjust as we go along. I believe that rather than trying to specify particular practices that as Senator Grassley says may be unsuitable when applied to farm A, but work appropriately in farm B, I think we want to try to express our objectives in broad performance terms. We want to avoid situations whenever the water quality in this stream does not reach this numerical value, then all of the farmers with adjacent land holdings or all farmers in the watershed are going to be penalized. I think that would be absolutely the wrong approach.

Senator CRAIG. I am glad to hear you talking in that way. Right now we are not doing that in other areas. We are trying to measure and therefore judge performance. Whether it is Endangered Species Act or other acts. We are trying to set fixed numbers and it is not working very well, I think.

Mr. WAYLAND. I do not think we are at that stage in terms of the next appropriate steps in dealing with agricultural runoff.

Senator DASCHLE. Thank you, Senator Craig. Our colleague Senator Grassley is here and I ask him for comments or questions.

Senator GRASSLEY. I am not on this subcommittee, so obviously I did not come prepared to ask questions. I just came to get a flavor of the thinking of the people involved in the study. On a note related to soil and water conservation and the profitability of agriculture, and an issue that will have to be decided next year, relates the future of the CRP. I do not think there is one question on agriculture in my State that I receive more questions about than, "What are you guys going to do about CRP?"

For instance, the Adams County CRP project in Corning, Iowa, has documented some impressive research. Just after 3 years, their research shows that livestock and cash hay operations on hilly land that is currently in CRP is more profitable than the present CRP payment, and more profitable than any one of two alternatives of cropping—even cropping in conformity with the soil conservation compliance practices. So you see, whatever economic incentives we had in farm bills to encourage farmers to plow up this land to capitalize on your base and the value of your farm, also cut down on the income of the farmers over the long haul. We actually did economic harm to the farmers who—if they were still in livestock or in cash hay—would be making more money over the last 15 years.

This may be too general of a question, but from the standpoint of economics of agriculture as you approached your study, did you look at the impact it would have upon profitability or whether that was even any concern of your study? If it was a concern of your study, what do you conclude if farmers would do everything just as you recommend it? Would it enhance profitability or lessen profitability? I am talking with a broad stroke. It would obviously be different maybe for corn and soybeans, and it would be different for wheat or other crops. But just in a general, how do you look at the economics of agriculture?

Dr. BATIE. The general answer is we were quite concerned with the question you raised, but the committee was unable to give that perspective. Part of the reason, we were unable, is the answer is very case specific. Nevertheless, the report emphasizes and I am also convinced by talking to my agronomist colleagues, for example, that in the use of fertilizer, there are many opportunities across agriculture for win-win opportunities to reduce fertilize use, to not impact yields. In these cases the farmer is better off for not buying fertilizer or as much fertilizer, and yields are not hurt, so profits are not reduced. The environment is better off, because there is less fertilizer as a potential residual in the environment.

There are other areas where win-win opportunities far more problematic. For example, a non-commodity crop like fruits where pesticides, fungicides, etc., are important components of the production process. Improving the input efficiency and through integrated pest management is an approach that the committee advocated, but we were unable to estimate to what such adoption would do to profits. Integrated pest management ideally should keep profits up and substitute more benign control, such as biological controls for pesticides. But the economics are not as clear. There are not as many studies as we would have liked on these issues and the committee did not address the economics to your satisfaction or mine.

Senator GRASSLEY. Do you approach the whole issue of the recommendations that you have made separate and collectively from the standpoint that they are so important, we have got to do them, regardless of the impact upon profitability. Or in the alternative, then we, as legislators, will have to make that judgment based on your recommendations?

But obviously, when politicians make that judgment, we probably have got to have a lot of concern about profitability, because you want to keep people that are going to accomplish what you want accomplished in the business of accomplishing that. If you would displace, say, the family farmer, you may get the corporate sector taking its place, they might have a little more leeway. But, unfortunately, there are many social aspects of the family farm that are lost in that sort of an environment.

Dr. BATIE. We were unable to approach this study as a benefit-cost analysis where we would look at the benefits of achieving water and soil quality versus the costs (and the cost to whom—to producers or to the general taxpayer). So we approached it by saying, if the Nation is going to pursue more water and soil quality, than this is what the science and the data that we have suggests is the way to proceed.

Speaking not as a committee member, but as an economist, what is profitable and not profitable in agriculture is determined in significant degree by public policy. In some sense, the committee's saying that if the public wants more water and soil quality, we ought to change some of the profitability of farming so it is more profitable to be better stewards, that is that we change some of the calculus. The report did not address the issue, but the prices that farmers are facing are not God-given; they are policy-given.

Senator GRASSLEY. The economic answer, some might posit, is that 1,200 acres in Iowa would be the most efficient size, as a point of comparison, the average farm, in Iowa, is about 350 acres. Over

1,200 acres, there might be a loss of some efficiency. So, some might argue, that is what we ought to tend towards. If that is a natural outcome of being efficient to have profitability, then you are talking about maybe a third of the farmers we have today. I am just wondering to what extent that was part of the thought process?

Dr. BATIE. The committee struggled with the issue a lot and it bothered me a great deal, as an economist, that when we talked about anything in this report, we could not put the numbers of what it would cost. The committee considered the smart trackers are of the technology to enable the farmer to know his yield data as he or she goes down a row to adjusts their inputs accordingly.

However, we know less about what such technology is and about what it will do to the structure of agriculture. How many farmers are going to be impacted negatively because they cannot adopt this technology? We just did not have the research to estimate these impacts in. The committee notes, however, that this is an issue we need to worry about.

Mr. JOHNSON. But one thing this book does very well though, I think, is to make us focus on these issues and agriculture. I have a lot of faith in agriculture and in the science and technology associated with it when we set our minds to it. We have shown that with conservation tillage, for example. In Iowa, we have shown with nitrogen management that when we really put our minds to it, we can improve. I guess where we hit our heads up against a brick wall, we need to step back and we need to ask the research community to join hands with us to see how we can farm in an efficient way and still farm in a sustainable way.

So a lot of this has to do with looking at things a little differently than we have in the past and I think that is an important contribution.

Senator GRASSLEY. I would have that same faith you expressed but I wonder whether society as a whole has the patience for the change that comes about the way you want it, and if they do have the patience, then I think we can accomplish it.

Mr. JOHNSON. We have to keep trying.

Dr. BATIE. I think you raise an excellent point too. I do a lot of work with a very broad audience from agriculturists to environmentalists and to the general public who do not have a vested interest in any particular outcome. I believe we have a lot of miscommunication between those audiences.

Many Americans do not know how farmers farm and they hold an image of farming that does not reflect reality. Thus, while some of the improvements have come about through reduced fertilizer use, through more benign chemicals these are not broadly recognize. I think if we improve some of general understanding there may be more time to implement what the committee called the agenda for agriculture. That is, there is a need for better communication as to where good stewardship is taking place, where the research community is lowering costs of being good stewards and similar information.

Mr. WAYLAND. Senator, I was just simply going to say that as we talk about the opportunity that is presented by the Clean Water Act, we have certainly recommended that we not set our sights on

trying to accomplish everything at once. That as a sort of first step, in those areas that are water quality impaired, we should be looking for the adoption of management practices or systems which we have confidence are going to be effective in reducing agricultural pollution and runoff. The system of measures that we have been focusing on, because they have been developed largely by USDA and then incorporated into a coastal pollution control program enacted by Congress now 4 years ago, would be implementation of a first round of measures that we have subjected to pretty careful cost analysis and which are practicable. We have adjusted those measures where it is apparent that some producers would experience real difficulty in implementing them.

If that proves not to be enough, we need to take another look at what the water quality is and consider whether a second round of measures in the future would be appropriate. But we think that we have the opportunity to take an iterative approach, which would begin by focusing on those areas that are impaired using approaches we have recommended. We would look at operations contributing most to the water quality problem, and then see how we do. We would evaluate water quality, undertake monitoring, and, determine if further actions are required. Practically speaking, the time frame is on the order of 15 years out. I think that there is an opportunity for new technologies and practices to become more widely available and use these new practices, including those that are just not common and ingrained. They may not represent a piece of hardware but an understanding about how we undertake production.

Senator GRASSLEY. Thank you, Mr. Chairman.

Senator DASCHLE. Thank you, Senator Grassley. Obviously, along the lines of some of Senator Grassley's concerns, I was going to ask what you anticipate to be your source of funding and Federal cost share? Where are you going to look to for the authorization on the funding stream to do the kinds of cost-share work that need to be done? Who can address that? Mr. Johnson? I assume, Section 319 of the Clean Water Act would be——

Mr. JOHNSON. Certainly there is Section 319. We have the ACP cost share programs right now. They are in ASCS. We hope soon they will be in NRCS, if the Secretary's reorganization proposal comes through. We also have the P.L. 566 program, the watersheds program, which in the past has been viewed as a concrete program. But it has changed considerably over the years to deal much more with these issues, and we think that we can continue to move in that direction.

Senator DASCHLE. Has there been any discussion at this point with OMB and others about the budgetary flexibility you are going to have to do things like this?

Mr. JOHNSON. It does not look good right now, but this is my first time through this. Everybody says it will get better as we go.

Mr. WAYLAND. Senator, if I could, you have mentioned Section 319 and the Clinton vision for change. That program is scheduled to go up to $100 million which is effectively a doubling of where we were just over a year ago. In terms of agricultural programs, this is not a lot of money. However, I think it is buying a lot in terms of environmental protection.

In addition, our Clean Water Act recommendations include trying to look for broader availability of low interest or no interest loans through the State revolving funds that have been capitalized and which right now are being used primarily to meet municipal waste water needs. In many parts of the country, the municipal needs have largely been met and the current eligibilities of the program are quite broad. I think agricultural cooperatives and other potential recipients of loans through that program have not been aware of its availability, and as Paul said, the P.L. 566 program has been seen as a concrete program. Well, that is certainly true of the Water Pollution State Revolving Fund Program, and we are trying to encourage States to think about what the environmentally, most beneficial, use of those funds is, and not just perpetuate the historical uses that have been mostly, municipal in nature.

Senator DASCHLE. Let me ask a question that certainly has been of great concern to me, not related to this issue as much as to past experience. We have gone through some horrific problems in coordination on things like wetlands in the past, where you have got multi-agency involvement and virtually a complete breakdown seemingly of any communication and a difficulty, therefore, for us to try to get to a point where you could see some kind of administrative streamlining and really some expectation that somehow there is going to be a coordinated policy to address some of these things. What can we do on something as important as this to eliminate that problem at the beginning rather than to have to go back and address it later on? Can you tell me today that discussions, negotiations, call them what you will, are underway to come up with a coordinated strategy to communicate and to implement these plans?

Mr. WAYLAND. Senator, I think that since the Clinton wetlands plan was announced in August, we have built substantial communications on coordination of the implementation of these programs. Not only in our headquarter's levels, but at the field level. There has been a lot confusion and concern about the operation of the Clean Water Act Section 404 program in tandem with the Swampbuster Program. We have made a number of changes that we think harmonize those programs and should reduce the level of confusion and concern about them.

The August plan made a commitment to have within 120 days a memorandum of understanding among the agencies to enlarge SCS's role in making field determinations concerning wetlands that would stand as the Government's determination for purposes of both the swampbuster program and the clean water program. We did not make it within 120 days, but we made it within 130 and we have just recently completed a detailed set of field procedures on how we will proceed. I think the four agencies that were involved, the Army Corps of Engineers, Fish and Wildlife Service, EPA, and USDA—feel quite good about where that comes out. There are many other aspects, of course, to the wetlands issue and program. Many of them were addressed in the August plan. We have had a recent milestone that I think is quite significant in terms of the completion of this agreement. It will assure that if a farmer has a determination from SCS on agricultural lands, there

will not be a later and different decision made by another Federal agency.

Senator CRAIG. Hooray.

Mr. WAYLAND. I think it is a breakthrough.

Senator CRAIG. If that is the end result, it is going to be a major breakthrough. This second and third and fourth guessing that has been going on out there for the last few years. I am amazed the American public, the effected public, did not revolt. They should have, but they did not.

Mr. WAYLAND. There were a lot of efforts that got our attention.

Senator CRAIG. Not as violently as we might have expected.

Senator GRASSLEY. Can I ask along that line and this is not the reason for this hearing I know, but since you got on the subject. Will the farmer be able to go to the Soil Conservation Service office and present his problem and get an answer or does that county office in turn have to confer with the same agencies before the farmer can get an answer?

Mr. WAYLAND. Not on a jurisdictional determination; not on an issue of what is a wetland; what is a farmed wetland; what is a prior converted wetland? The agencies are working together to make sure that we all have confidence that the answer is the right answer. But there will not be a second bite at the apple by a Federal agency once that answer has been given. We are putting the procedures in place to make sure that there is good joint training among the agencies. There is the common set of procedures, but there will not be a later determination by EPA or by the Corps that says, now we do not agree with what SCS decided here.

If we see that within a particular county or State that there are recurring problems, we may revisit this issue. We may decide to correct those problems, but not in terms of revisiting an individual jurisdictional determination.

Senator GRASSLEY. Under that procedure and I am not sure that this is a legal term, but it has been used before, is the Soil Conservation Service the lead agency?

[The prepared statement of Senator Grassley follows:]

STATEMENT OF SENATOR GRASSLEY

I'd like to thank Senator Daschle for holding this most important hearing. The condition of our soil and the quality of our water is not only a very important subject, but a timely one as well. The 1995 farm bill is looming on the horizon, and the impact of conservation compliance on soil and water quality will certainly be reviewed then. Moreover, the reauthorizing amendments to the Clean Water Act will soon begin winding their way through the EPW Committee. Both of these measures are an attempt to stem erosion and improve water quality. Both measures will have a big impact on our Nation's farmers and ranchers.

I will keep my remarks brief, but would like to make two points.

In addressing the issue of soil conservation and water quality, we must keep in mind that 1-size will not fit all; that solutions we prescribe, or the incentives we fashion, must be flexible enough to encompass the unique characteristics of the American landscape and the diverse elements of U.S. agriculture.

Our success or failure as a Nation ultimately depends on the voluntary actions taken by millions of our Nation's farmers and ranchers. The report recognizes that crucial role the individual farmer or rancher plays in this process, noting that the "role of national policy should be to create incentives that influence the information and technologies that producers use to manage their farming systems."

Secondly, for the first time ever, nonpoint-sources of pollution probably now outnumber point-sources. But let us not lose sight of one very important fact: Point sources of pollution have been given 20 years and over a $100 billion dollars in pub-

lic and private monies to comply with the law, as laid out in the 1972 Act. The realities of the Federal deficit dictate that the same public commitment in Federal funds will not be available to nonpoint-sources. As many environmental groups have made so patently clear, agriculture should not get the same 20 years.

Unfortunately, it is a problem that cannot be cleared up in 5 years, 10 years, or maybe even 20. It may be a decade before we can quantify all the data regarding the impact conservation compliance is having on our soil and water. These factors alone should counsel deliberation and study, rather than quick and glib responses to a complicated issue.

Like a guest on a talk show, I can't help but make a plug for the recent efforts of Senator Heflin and myself. We have formed a Clean Water Caucus to focus on nonpoint runoff issues, and how the Clean Water Act will affect agriculture. The interest and response from our Senate colleagues have been overwhelming. We look forward to working with the Environment and Public Works Committee, as well as our other Senate colleagues, to fashion a bill that brings a common-sense approach to the issue of water quality.

Again, I would like to thank Senator Daschle, and Senator Craig for their interest on this issue, and I look forward to reviewing, more completely, the results of this study.

Mr. WAYLAND. Yes, for jurisdictional determinations. Now if the farmer, for example, wants to undertake a major construction project and he has decided his next crop is going to be apartment buildings, the jurisdictional determination will have been by SCS. However, for discharges associated with taking that land and making it into uplands for purposes of construction, that will be a permitting decision made by the Corps of Engineers under the 404 Clean Water Act program.

Senator DASCHLE. But you are saying that for normal farming operations, it will always be SCS?

Mr. WAYLAND. That is correct.

Mr. JOHNSON. I would like to add to Mr. Wayland's comments that I think that we have done something very historic here in all of these agencies coming together and agreeing on this. But I would caution you, the easy part is probably done. We still have to go out and work with the landowner. We all have to understand what wetlands are and we have to all agree that they are important and we have been assigned that task and it is not going to be an easy one.

But we look forward to the Clean Water Act in the same way and we are going to, from our experience on wetlands, we hope to move forward on that as well in partnership with not just EPA, but our State agencies, since they are going to be very important players in that.

Senator DASCHLE. I believe we were talking about funding just a minute ago and I was going to follow up with that. Mr. Wayland, you indicated that you are optimistic that because of some of the increases in funding, that we are going to have more of an ability to tap resources that are there under 319. But in agriculture, Mr. Johnson, we have been grossly underfunded for a lot of reasons. But certainly I do not see any major new funding stream coming into these programs. Can you be as optimistic as Mr. Wayland was, or what are we going to do about that?

Mr. JOHNSON. Coming off a farm in Iowa, I just do not understand this. We are talking here that if we doubled our funding efforts between SCS and EPA it would be the equivalent of about two cans of coke a year per person in this country. When we talk about the issues and the importance of these issues, there ought

to be some way we can do it. Again, like I say, I am somewhat naive probably, but these are very important issues, nothing more important, I believe, over the long term than to care for our resources. We think we know how to do it. We are all working together now like we have never done before. I guess I would just urge this Nation to take a good look at this and to see if we cannot pull together what many of us would view are somewhat meager funds. We think we can really do the job, if we could do that.

Senator DASCHLE. I have a number of other questions that, unfortunately, I may have to make part of the record. We have another hearing that we have to get to, and I regret that, because I have a number of topics here that I would love to have addressed, but we had great participation. Obviously, you can see there is a lot of interest and I am more gratified about that than I am about my concern about not having the chance to ask more questions. So I will insert them in the record and if I could ask for your comment on these questions, I would appreciate it. We will leave the record open for a 30-day period of time. It has been a constructive hearing. I appreciate very much your willingness to participate.

Dr. Batie, thank you. Senator Craig?

Senator CRAIG. Before the gavel goes down, let me ask unanimous consent that a statement by our colleague Senator Thad Cochran become a part of the record.

[The prepared statement of Senator Cochran follows:]

STATEMENT OF SENATOR COCHRAN

Thank you, Mr. Chairman, for holding this very important hearing to review this report by the National Research Council. There is no question that environmental concerns have increasingly become a focus of agricultural policy. As we prepare for the 1995 Farm Bill, it is important that we have as much information as possible, so that we can make sound decisions for the future of agricultural policy, while protecting our Nation's valuable natural resources.

There is a public perception that production agricultural practices harm the environment. A recent national poll indicated that two-thirds of those surveyed think that:

— pesticides are used too much in agriculture
— farmers use pesticides improperly
— pesticide risks outweigh their benefits, and that
— pesticide use should be severely restricted

There is no doubt that agricultural policy will be increasingly influenced by concerns about soil and water quality. Sound scientific research is needed to give us a factual basis for policy making. Soil erosion, characterized by many as the most serious environmental problem of agriculture, is projected by 1995 to decrease by two-thirds from 1986 levels due to conservation programs implemented in the 1985 Farm Bill and improved upon in the 1990 Farm Bill. These programs have helped to reduce soil erosion to less than one-third of levels in the 1930's.

Another public perception is that production agriculture contaminates our Nation's drinking water. However, according to the results of the extensive EPA National Survey of Drinking Water Wells in 1990, only 1.2 percent of urban wells and 2.4 percent of rural wells contained concentrations of nitrogen above levels considered safe by the EPA. The survey also found that less than one percent of both urban and rural water wells contained pesticide residues above safety standards established by the EPA. These results suggest that potential drinking water contamination from agriculture is a manageable problem.

While everyone in this room would readily agree that there is a need to further protect the environment, and insure an abundant supply of clean drinking water, there is also a need to maintain a strong, vigorous, and economically, healthy agricultural sector. Nonetheless, there are new expectations for American agriculture.

Farmers need to assume additional responsibilities to reduce: erosion; chemical and fertilizer runoff; animal waste runoff; and destruction of wildlife habitat.

It is my hope that a practical, common sense approach, which maintains a balance between the protection of the environment, and the recognition of the need to maintain a strong, agricultural sector while protecting private property rights, will be taken. I look forward to the testimony of these witnesses, and working with this committee on this very important subject.

Senator DASCHLE. Without objection, it will be a part of the record. With that, the hearing stands adjourned. Thank you.

[Whereupon, at 4:37 p.m., the subcommittee was adjourned.]

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APPENDIX

PREPARED STATEMENTS

Sandra S. Batie, Ph.D[1]

Thank you, Senator Daschle, for the invitation to testify today on the recent report of the National Research Council, *Soil and Water Quality: An Agenda for Agriculture*. As you are aware, I was the chair of the committee. Other members of the committee are identified in an appendix to my written testimony. My remarks today will be addressed to the committee's recommendations; I will identify any personal views as my own. The committee was formed in response to a request in 1989 to the Board on Agriculture of the National Research Council. The Board was asked to assess the science, technical tools, and policies needed to protect soil and water quality while providing for the production of food and fiber from U.S. croplands. The study was supported by the USDA Soil Conservation Service, the U.S. Environmental Protection Agency, and The Joyce Foundation. The committee focused attention on soil and water quality as they relate to agricultural croplands. The committee did not address problems on either forested lands or rangelands.

Some major contributions of the report to the policy debate (and to future research efforts) are:

(a) the examination of the linkages between soil quality and water quality,
(b) the identification of opportunities to improve both farm profitability and environmental quality,
(c) the emphasis on farming systems as a basis for program design and delivery, and
(d) the potential payoff from the targeting of programs and technical assistance to problem areas and problem farms within these areas.

As I discuss today the major conclusions of *Soil and Water Quality: An Agenda for Agriculture*, you will see these four themes in evidence throughout.

MAJOR CONCLUSIONS OF THE REPORT

The major conclusions of the report relate to opportunities to improve soil and water quality, obstacles to change, targeting of programs to problem areas and problem farms, using the farm system approach to integrated farm planning, and funding of programs.

Opportunities to Improve Soil and Water Quality

Available data on soil degradation and water pollution are sufficient to cause concern, but are often not adequate to confidently set public priorities based on the severity of damages to soil and water quality. The committee therefore directed its attention to strategies which would refine the management of farming systems so as to protect soil and water quality with as little impact as possible on farming

[1] Views expressed in this testimony are those of Dr. Sandra S. Batie and the National Research Council Committee on Long-Range Soil and Water Conservation Policy and do not represent official positions of Michigan State University.

profitability. Using the science and data available to us, we organized the report around four major opportunities to improve soil and water quality:

- conserving and enhancing soil quality
- increasing input use efficiencies
- increasing resistance to erosion and runoff
- creating field and landscape buffers.

The committee found that national policies to protect soil resources are too narrowly focused on controlling erosion and conserving soil productivity. Other important concerns include salinization, compaction, acidification, and loss of biological activity. Soil is a living, dynamic substance that acts as an interface between agriculture and the environment. High-quality soils can prevent water pollution by absorbing and partitioning rainfall and by breaking down agricultural chemical, wastes, and other potential pollutants. Protecting soil quality is the first step toward protecting water quality. Thus, the committee recommended broadening the policy approach to include conserving and enhancing soil quality. Protecting soil quality is related to but not synonymous with slowing erosion rates. Rather, conserving soil quality means protecting the full range of services that high-quality soils provide, giving soil quality the same attention in national policy that we give to air and water quality.

Improving the way fertilizers, pesticides and irrigation water are used can prevent pollution at its source. The committee found there were technologies and management methods available to improve the efficiency of use of agrichemicals so that fewer agrichemicals become pollutants in the environment. Therefore, the committee recommended that increasing the efficiency with which nutrients, pesticides, and irrigation water are used in farming systems should be a fundamental objective of policies to improve water quality.

The committee also recognized that a major opportunity to improve soil and water quality involved increasing the ability of the farming systems to resist erosion and runoff. Investment over the years in research and development has produced many different conservation systems such as rotations, cover crops, and reduced tillage that have proven potential to reduce erosion and runoff. Today about 30 percent of our croplands are farmed using reduced tillage, for example. Full enforcement of conservation compliance and other initiatives that were enacted in the 1985 and 1990 Farm Bill could expand the amount of cropland in conservation systems.

In many watersheds, "field-by-field" efforts to conserve soil quality, increase efficiency, and reduce erosion and runoff will be insufficient to protect the environment. Buffer zones, such as vegetation along streams, strategically planted grass strips, fencing livestock away from waterways, or even artificially constructed wetlands could help to intercept or immobilize pollutants and reduce runoff. Thus, the committee recommended the protection, restoration, and creation of field and landscape buffer zones where appropriate.

Each of these four major opportunities to improve soil and water quality problems have considerable promise. They should not be thought of as discrete, separate objectives. Rather the committee presented them as a set to be simultaneously pursued through policy and farm systems planning. A balanced approach is the best way to avoid trade-offs between environmental objectives and minimize the costs imposed on producers.

The committee found many technical and management methods already exist to pursue these four opportunities to improve soil and water quality. Some methods even enable producers to reduce their use of agrichemicals while maintaining yields. One robust example of such opportunities can be found in fertilizer management. The committee found considerable research evidence that many producers have considerable opportunity to reduce nitrogen use in the soil-crop system by properly accounting for all sources of nitrogen and by having realistic yield goals. In study after study, producers were found to be able to reduce fertilizer with little or nor impact on yields.

Obstacles to Change

A major question posed by our committee was, why are these technologies and management methods not being used more widely? Here the committee did not find as definitive a set of answers as we would have liked. The inadequacy of studies on why farmers make the choices they do as well as the diversity of enterprises in American agriculture, make it difficult to pinpoint the precise effect of alternative policies on the behavior of producers. The committee felt however, that a general understanding of the factors that influence producers' decisions can guide changes in policy to change improve the way producers manage their farms.

Agricultural Policy. One barrier to change is agriculture policy, and the committee made recommendations for changing agricultural policy to provide incentives for producers to change the way they manage their farms in order to better protect soil and water quality. The committee noted strongly that long term protection of soil and water quality should be based on policies and programs that are independent of price support, supply control, or income support mechanisms. The committee further recommended that policies be targeted to problem areas and problem farms, regardless of participation in Federal commodity support programs.

Failure to Target. The unwillingness or inability to target programs at problem areas and problem farms is a serious barrier to improving the management of farming systems. The traditional emphasis in conservation programs has been on widely distributing technical and financial assistance to encourage the use of soil and water protecting technologies and methods. With the limited information on the location of water quality pollution and soil quality degradation that has been available in the past, and with more adequate Federal and State budgets, such wide distribution of programs may have been defendable. But now with the availability of new data sets, models, and improved scientific understanding, we are increasingly able to identify where problem areas and problem farms exist. Continuing with programs that are not targeted appropriately will result in our limited conservation resources being spread too thinly, impairing the effectiveness of programs.

The report addresses the need to target programs[2] based on an (1) articulation of national or State goals for soil and water; (2) identification of regions where the benefits from achieving the goals per dollar invested are greatest; (3) identification of the linkages among farm practices, soil quality, and water quality; and (4) identification, within a targeted area, of those enterprises that contribute to the problem as well as the barriers to changing their farming systems.

The committee recognized that while we do not have all the information to undertake such targeting with a high degree of refinement, there are very solid beginnings with both improved models and data sets. For example, Geographic Information Systems (GISs) have the potential to greatly increase the usefulness of existing data.

Within the report, the committee identifies where there are serious obstacles to targeting, and we provide recommendations for overcoming these obstacles. Research and data collection are needed that identify the linkages between relevant natural resource data, production practices, and socioeconomic data in order to realize improved targeting and program direction from an integrated approach based on farming systems.

Systems Approach. Another barrier to wider use of available technology is the historic emphasis on single purpose best management practices. The committee recommends focusing research and policy on the linkages between natural resource data, production practices and socioeconomic data by taking a systems-level approach to analyzing agricultural production systems. To quote from the report:

> "The focus of such an analysis is the farming system, which comprises the pattern and sequence of crops in space and time, the management decisions regarding the inputs and production practices that are used, the management skills, education, and objectives of the producer, the quality of the soil and water, and the nature of the landscape and ecosystem within which agricultural production occurs. An integrated systems approach is necessary for the development of policies and programs to accelerate the adoption of farming systems that are viable for producers, that conserve soil quality, and that do not degrade water quality, and that do not degrade water quality (*Jackson and Piper*, 1989).[3]"

Thus, the committee recommended two types of research should be high priorities for USDA and EPA research programs: (1) research directed at identifying the nature and magnitude of factors influencing producer's management of cropping and livestock production systems and (2) research leading to the development and implementation of new technologies, cropping systems, and methods to manage farming systems that are profitable and protect soil and water quality.

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[2] Note: The committee recommended that targeting should not stop at the region or watershed level. Within a problem area, the committee recommended the targeting of programs—mandatory or voluntary—to the problem farms within a problem area. Such targeting will reduce the cost and increase the effectiveness of the programs. In addition, targeting problem farms could have the added advantage of protecting farms with good stewardship practices from unnecessary costs and inconveniences, assuming the costs of compliance were borne by the producer.

[3] Jackson, W. and J. Piper. 1989. The necessary marriage between ecology and agriculture. *Bulletin of the Ecological Society of America*, 70:1591–1593.

Use of a farm system plan rather than individual best management practices as the foundation for efforts to improve soil and water quality not only provides a basis for targeting programs and financial assistance, but also provides a basis for coordinating local, State, and Federal programs. In addition, it increases the possibilities of exploiting opportunities to simultaneously improve financial and environmental performance.

While it would be ideal to have "performance criteria" that directly relate farming practices to measurable changes is soil and water quality, initial integrated farming plans will at least initially have to rely on "planning criteria"[4] within the farming system. It was also evident to the committee that excellent record keeping is absolutely essential if integrated farm plans are to be successful in improving soil and water quality.

Funding. The committee realizes that the recommendations of its report will require either substantial reallocation of existing funds or a significant new source of funds if current initiatives and programs are to comprehensively address soil quality, input efficiencies, resistance to erosion and runoff, and field and landscape buffer zones. We note that there are many Environmental Protection Agency and United States Department of Agriculture programs, initiatives, and authorities that could provide mechanisms to implement the agenda for agriculture that is presented in the report. However, funding for these programs has been limited. Economizing on the funds available by targeting will help, but the committee also suggested the possibility of small taxes on nutrient and pesticide inputs, and/or transfers of funds from commodity programs as additional revenue sources.

In Conclusion

In closing, I want this subcommittee to know that I was most fortunate in having an excellent committee of experts who volunteered considerable time and effort to this report. In addition, the NRC project director, Craig Cox, was critical to this report's excellence and timely publication. Our objective in writing *Soil and Water Quality: An Agency for Agriculture* was to provide a report that would truly assist in the policy debate with respect to water and soil quality by providing and organizing the pertinent science and research in a meaningful manner. Within the limits of the resources available to us, I feel the report has been successful in meeting these objectives.

I welcome your questions.

Craig A. Cox

Thank you, Mr. Chairman, and Members of the Subcommittee, for the invitation to testify today on the series of roundtable discussions the Board on Agriculture has hosted following the release of the report, *Soil and Water Quality: An Agenda for Agriculture.*

The study committee, as Dr. Batie's testimony explains, concluded that traditional soil conservation programs must be augmented with new approaches to solve the soil and water quality problems that are now attributed to farming practices. Congress, the U.S. Department of Agriculture (USDA), and the U.S. Environmental Protection Agency (EPA) will be faced with the task of fashioning these new approaches out of a mix of laws and programs, each with their own priorities, objectives, and approaches. The success of national policies, however, will depend on the initiative of local officials, agriculturalists, and environmentalists to translate national goals for local and regional conditions.

The Board on Agriculture is convening four regional roundtables bringing together local farmers, technical experts, environmental advocates, agribusiness people, and officials to discuss opportunities to refine and implement the recommendations in the report. The roundtable participants are specifically asked to debate (1) the changes in farming practices and land use that are required to solve soil or water quality problems in the local area; (2) opportunities to better use and coordinate current USDA, EPA, and state programs; and, (3) national policy initiatives needed to address gaps in current programs.

The Board on Agriculture hopes that the experience of local officials and communities, coupled with the recommendations in the Board on Agriculture report, will help Congress and the administration develop coherent policies that support local efforts to prevent soil degradation and water pollution caused by farming practices.

Two roundtable discussions have been held to date. The first roundtable focused on the Corn Belt and was held in Des Moines, Iowa, December 1–2, 1994; the second

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[4] Planning criteria are also known as design criteria or technology based criteria.

was held December 7–8, 1994, and focused on the lower Mississippi River Delta. I have included a list of the participants in these roundtables in an addendum to this testimony. Two additional roundtables are being organized, one in the Great Lakes region and another in the watersheds supplying New York City with drinking water.

Before I summarize the ideas that were discussed in the first two roundtables, I would like to acknowledge the support of Pioneer Hi–Bred International, Inc., The Joyce Foundation, Caterpillar, Inc., USDA Soil Conservation Service, and the U.S. Environmental Protection Agency for our roundtable series. The roundtable series would not be possible without their generous financial support.

The discussion at the roundtables was lively. I have tried to summarize what were vigorous and diverse discussions into three broad themes that generated the most discussion and support: (1)improving the effectiveness of technology transfer by using a farming systems approach, enlisting the private sector, facilitating working partnerships, and addressing problem farms; (2)developing Federal initiatives providing leadership in protecting soil quality, reorganizing USDA, targeting programs, increasing support to Federal programs that are working, and sending consistent signals to farmers; and (3)addressing the need to build and reinvigorate local institutions.

I want to stress that the ideas I am presenting are those of the participants in the discussions. The ideas that I will summarize below have not been reviewed by the National Research Council and should not be construed as a product of the National Research Council. I also want to stress that the participants were encouraged to shed their institutional, organizational, interest group, or business affiliations and participate as individuals. The roundtables sought to draw out personal opinions based on experience and expertise. The ideas summarized in this statement should not be interpreted as the official positions or policies of the participants' agencies, organizations, or interest groups. I should also note that the participants in the roundtables have not reviewed the testimony I am presenting today.

TECHNOLOGY TRANSFER

There was broad consensus among participants at the roundtables that technology is advancing rapidly and has outstripped the capacity of traditional technology transfer mechanisms. Technologies ranging from residue management to precision application of agrichemicals have advanced much more quickly than the techniques and programs used to transfer that technology to producers. The application of modern marketing techniques to technology transfer is rare and economic analysis of alternative technologies is lagging. As a result, the delay between development and application of new technologies can be long.

Participants argued that a renewed initiative to transfer emerging technologies to producers is essential. Many participants stressed, however, that this new initiative cannot be business as usual. New approaches are needed that are based on a systems approach, enlist the private sector, facilitate working partnerships, and address problem farms.

Systems Approach

Changing the objective of technology transfer programs from the adoption of a single-purpose best management practice to refining the management of the whole farm system was repeatedly raised as a key to facilitating the adoption of new technologies. A whole farm approach is critical, the participants argued, to the effective use of new technologies that are increasingly information based such as improved soil or tissue testing, yield monitors that allow farmers to track differences in yield from field to field, or sophisticated cropping systems that employ multiple or stripped crops.

There was general agreement that the primary advantage for producers of a systems approach is the greater likelihood that opportunities to improve profitability while protecting soil and water quality will be recognized. The information needed by farmers to protect soil and water quality by refining the decisions they make about tillage, input use, crop choice, and crop rotations is, in most cases, compatible with information needed to improve profitability. The probability of recognizing and taking advantage of win-win opportunities is much greater when a whole farm approach is used.

Participants also argued that the farming system approach could be a unifying mechanism for EPA, USDA, and State and local soil and water programs. Participants saw an opportunity to make water quality plans that may be required by Federal and State nonpoint source pollution programs an integral component of whole farm plans that also meet conservation compliance, or other requirements.

Despite the promise of the farming system approach, several participants voiced skepticism about the capacity of Federal, State, and local government or the private sector to implement such an approach now. They suggested a set of pilot projects to test the implementation of integrated systems approaches.

The participants also agreed that the Federal Government will have to play a major role in quality control and assuring consistency in the implementation of integrated farming system plans. A set of consistent guidelines and measurable indicators of plan implementation that apply to all Federal programs that seek to prevent soil degradation and water pollution will be needed. The setting of such guidelines should be a process that explicitly involves groups outside of Federal agencies, including the private sector and nonprofit interest groups.

Enlisting the Private Sector

The participants agreed that the most effective investment of public dollars would be to equip and train those people who will be the farm system advisors that can work with farmers to refine the management of their farms. Participants were doubtful, however, that the public sector alone will be able to meet the needs for advisors. Participants were certain that if farmers receive substantially different messages from public and private sector advisors the adoption of new technologies will be thwarted.

Independent crop and soil consultants, input dealers, and other private sources of advice are increasingly important sources of information and advice to farmers. The participants agreed that it is essential that these private sector advisors be enlisted in the effort to protect soil and water quality.

There was general agreement that certification of public and private advisors, or other mechanisms are needed to insure the quality and consistency of the technical advice delivered to farmers. The participants suggested that the Federal Government should provide overall guidance for the certification of advisors, but such certification programs would best be implemented by States or nonprofit organizations. The participants noted, for example, that the American Society of Agronomy is currently developing certification programs for crop consultants. The participants also argued that enlisting the private sector should not be based on providing continuing subsidies to farmers or to industry. Public dollars would be best spent on training and equipping advisors. Incentives such as short-term payments to farmers to introduce management changes that will continue without ongoing subsidies after the transition period may be useful. One suggestion, for example, was a 25 cents an acre incentive payment for keeping records. These incentive payments, participants suggested, would serve to stimulate demand for private and public sector advisors.

Facilitate Real Partnerships

From personal involvement, the participants concluded that real working partnerships between Federal, State, and local government, farmers, industry, and environmentalists was the common ingredient in successful projects. Developing working partnerships with agencies and organizations with different agendas and clientele is easier said than done. In their experience, participants felt that successful partnerships require (1) clearly defined and commonly accepted goals to be met by the parties involved and (2) indicators of changes in the management of farming systems that can be used to evaluate the success of the partnership. The participants stressed that changes in the mind-set of partners rather than changes in the organizational chart is the key determinant of success.

The participants discussed at length a competitive block grant program as a way to facilitate the formation of partnerships. These grants would be open to any group of organizations or agencies that can demonstrate that they can leverage the efforts of Federal, State, local, private and nonprofit groups to solve a clearly defined soil or water quality problem. Several participants suggested the Small Business Innovation Program 85 a model. This program is a multistage process. The first stage is a planning grant that can be used to empower groups that don't normally get funds. Stage two is receipt of the block grant, and stage three is leveraging local funds to keep the initiative going over the long-term as the block grant expires. Other participants suggested USDA's Resource and Community Development Program as another model.

Problem Farms

Participants discussed at length the difficulty of reaching producers that are resistant to change with traditional programs to solve soil and water quality problems. It was the participants common experience that a certain portion of producers are very slow to adopt new technologies or management practices. Their resistance to change may be caused by many factors including financial stress, land tenure, or because the farm operation is only a small share of total family income. Participants

also identified limited resource farmers as a special case of producers that are often not reached by traditional technology transfer programs.

Passive voluntary programs that wait for producers to volunteer for technical assistance are likely to fail if watersheds include a large number of resistant or limited resource producers. New approaches that more aggressively reach out to producers that have not historically been part of traditional programs will be needed. Organizing programs to reach producers that are resistant to change, that don't volunteer or ask for services, that are farming primarily marginal lands, or that have only marginally profitable operations, will be a major challenge.

FEDERAL INITIATIVES

Most of the participants stated that State and local government will increasingly play the primary role in addressing soil degradation and water pollution problems attributed to farming practices. The participants argued that soil and water quality problems and the nature of farm enterprises are often site-specific. We will have to rely on State and local government to tailor the implementation of programs to local circumstances.

The participants did think, however, that the Federal Government has a critical part to play in providing leadership, quality assurance, and coordination.

Soil Quality

The participants agreed that the protection of soil quality, broadly defined, is critical to the long-term success of environmental programs and in sustaining agricultural productivity. The historic concern for erosion is important, but too narrow. In the Delta, for example, participants argued that substantial declines in soil quality from compaction and loss of tilth are occurring on lands that are not very vulnerable to erosion.

The participants concluded that the Federal Government will have to take the lead in broadening and increasing the importance of protecting the quality of soil resources. Some participants suggested that the Congress incorporate a major Federal policy statement that equates soil quality with air quality and water quality into the next farm bill. Others emphasized the need for Federal leadership in research to develop quantitative criteria that can be used to guide soil management at the farm level.

USDA Reorganization

The proposed reorganization of USDA was a hot topic of discussion. Most participants endorsed the idea of consolidating natural resource cost-sharing, technical assistance, and compliance functions into one agency within USDA. All participants agreed that USDA must reorganize itself to provide greater leadership in solving the environmental problems now attributed to farming practices. All participants agreed that the research, technical assistance, and cost-sharing programs that currently exist within multiple USDA agencies simply cannot be duplicated by any other Federal or state agency—trying to recreate this infrastructure elsewhere would be costly and foolish. The participants were concerned, however, that USDA find ways to overcome the barriers imposed by differences between agencies in priorities, objectives, and approaches. In most cases, the participants argued, these institutional barriers currently extend to the state and county level.

Some participants argued that USDA should undertake an internal audit and assessment of its rules and programs to determine how they support or conflict with protecting soil and water quality.

Targeting

The participants reaffirmed the essential role of the Federal Government in setting goals and priorities for protecting soil and water quality. Many participants stated that the funding pie is currently divided between so many agencies in so many regions that there is not the critical mass of resources in any region or in any agency to get the job done. Instability in priorities is also impairing the ability of agencies to build the staff capacity needed to address soil and water quality problems.

Many participants argued that the need to select problem areas and fund initiatives in those areas at the level required to actually accomplish the objectives is urgent. These participants expressed the concern that spreading resources prevents the agricultural community from demonstrating that they can and will solve soil and water problems. Others argued that farmers are being asked to be more efficient; the Government needs to be asked to become more efficient as well. These participants stated that inefficiencies and competition among agencies is a serious problem.

Federal Programs That Work

Participants in the two roundtables singled out two new Federal programs, the Water Quality Incentives Program (WQIP) and the Wetland Reserve Program (WRP) as examples of new initiatives that deserve much greater support.

Water Quality Incentives Program

Participants who had direct experience with WQIP, argued that the dollars spent through WQIP to facilitate the implementation of a farming system plan were more effective than more traditional cost-sharing programs funded through the Agricultural Conservation Program (ACP). Several participants argued that they would like to see the WQIP model extended to all cost-sharing programs in ACP. There was general agreement among participants that the WQIP was a pilot program that had proved its value and deserved to be beefed up.

Several participants argued, however, that WQIP has proved most effective when part of a more comprehensive effort to improve water quality in targeted watersheds. These participants argued that WQIP should not be administered as a practice under the ACP. Rather, these participants preferred a stand-alone program with resources directed to problem watersheds.

Wetland Reserve Program

Participants also agreed that the Wetland Reserve Program has proved its merit. The participants would like to see increased funding, but acknowledged that high cost per acre for easements will be a serious impediment to increased participation. Several participants argued that the administrative costs of the program could be substantially reduced by eliminating the current requirement that a complete management plan be prepared for each wetland offered in the bidding process. Since only 10 percent of the lands offered are accepted for an easement, large administrative costs are invested for a small number of acres protected. Some participants also argued that the costs saved by reduction of commodity program payments should be considered as a partial off-set to the costs of wetland easements.

Participants also argued that state-wide priorities for wetland preservation and restoration are essential. Several participants urged States to identify "critical wetland complexes or districts" to guide the purchase of wetland easements. Such targeting, they argued, could reduce the per acre cost of wetland easements and provide a mechanism to coordinate state wetland mitigation requirements with the Wetland Reserve Program.

CONSISTENT SIGNALS

There was a great deal of discussion in both roundtables about the need to find ways to consistently reward "good actors" rather than unintentionally rewarding "bad actors".

Many participants argued that progressive farmers that adopt new technologies, cropping systems or farm management methods early often find that their more resistant neighbors are the producers that eventually receive incentive payments or cost-share dollars. Similarly, producers that kept highly erodible land in soil conserving crops were not eligible to enroll those lands in the Conservation Reserve Program. Many participants also worried that progressive farmers were being "tarred with the same brush" as problem farmers and as a result, the progress many producers have made toward protecting soil and water quality is not being recognized. Policies are developed, they argued, as if all farmers are the same and are using the same management practices. In reality, there is a great range in the sophistication of technology and management methods used by farmers. These participants argued that ways need to be found to distinguish between "good actors" and "bad actors". Many participants argued that the Federal Government should encourage States to define a minimum standard of "good agricultural practice" that producers should be expected to meet as a condition of land-ownership and management. These participants argued that producers that go beyond the minimum standard should be rewarded by eligibility for incentive payments, cost-sharing programs, tax credits, or relief from liability or regulation.

Other participants argued that the Clean Water Act and the Farm Bill should be integrated around the whole-farm approach to improving the management of farming system with incentives for the "good actors" and regulation for the "bad actors." These participants argued that the voluntary approach will work if the threat of regulation is credible. Other participants argued that the concept of compliance should be extended beyond highly erodible lands to include all croplands of producers that participate in price support or supply control programs. Others argued that revenue insurance or graduated "green payments" should replace the current

price support and supply control mechanisms to separate support for farmers from cropping and production decisions.

BUILD AND REINVIGORATE LOCAL INSTITUTIONS

Participants also spent a great deal of time discussing the need to strengthen local institutions to deliver the one-on-one contact with producers that the participants agreed is critical. The success of national policies will in large part, the participants argued, be determined by the capacity and capability of local institutions. There is wide variation, however, in the strengths, capabilities, and support for local institutions.

Most participants concluded that building and supporting these institutions will primarily be a function of State and local government. These participants were skeptical that local institutions could be sustained over the long term solely on Federal support. Many participants did suggest that the block grants for working partnerships that were discussed earlier could be a useful way to build local capacity.

Other participants argued that the Congress should revisit the model State legislation that created soil and water conservation districts to reenergize, update, and renew social contracts with the districts as the primary implementing agency for preventing soil degradation and water pollution attributed to agriculture.

In closing, I would like to thank you again, Mr. Chairman, and Members of the Subcommittee for the opportunity to testify today. I would be pleased to answer any questions, or provide the subcommittee with further details about our roundtable discussions.

List of Participants
Corn Belt Roundtable
December 1-2, 1993
Hotel Fort Des Moines
Des Moines, Iowa

Lyle Asell
USDA Soil Conservation Service
Des Moines, Iowa

Jim Birkholtz
Minnesota Board on Water
and Soil Resources
St. Paul, Minnesota

Craig Cox
Board on Agriculture
Washington, D.C.

Steve Daugherty
Pioneer Hi-Bred International, Inc.
West Des Moines, Iowa

Mike Duffy
Department of Economics
Iowa State University

Julie Elfving
U.S. Environmental Protection Agency
Kansas City, Kansas

Dan Freiberg
Agribusiness Association of Iowa
Des Moines, Iowa

Jeff Gabriel
Pioneer Hi-Bred International, Inc.
West Des Moines, Iowa

Jim Gulliford
Iowa Department of Agriculture
and Land Stewardship
Des Moines, Iowa

George Hallberg
NRC Committee Member
Iowa Department of Natural Resources

Neil Hamilton
NRC Committee Member
Drake University Law School

Dave Jelinski
Wisconsin Department of Agriculture,
Trade, and Consumer Protection
Madison, Wisconsin

Doug Karlen
National Soil Tilth Laboratory
Ames, Iowa

William Northey
National Corn Growers Association
Spirit Lake, Iowa

Chris Novak
National Pork Producers Association
West Des Moines, Iowa

Margaret O'Dell
The Joyce Foundation
Chicago, Illinois

Steve Oltmans
Papio Natural Resources District
Omaha, Nebraska

Ann Robinson
The Izaak Walton League
Decorah, Iowa

Stan Reimann
Farmland Industries, Inc.
Kansas City, Missouri

Max Schnepf
Soil and Water Conservation Society
Ankeny, Iowa

Dave Swaim
Swaim and Associates
Agronomic Consultants
Crawfordsville, Indiana

Dave Williams
Villisca, Iowa

List of Participants
Delta Roundtable
December 7-8, 1993
Agricenter International
Memphis, Tennessee

V.C. Cliff Bice
Tennessee Valley Authority
Muscle Shoals, Alabama

Elton Bryant
Covington High School
Covington, Tennessee

Ray Bryant
Lower Mississippi Delta
Development Commission
Memphis, Tennessee

F.E. Fae Busby
Winrock International
Morrilton, Arkansas

Bettye Ann Cooper
Office of Congresswoman
Blanche Lambert
Jonesboro, Arkansas

Craig Cox
Board on Agriculture
Washington, D.C.

Leroy Davis
Southern University
Baton Rouge, Louisiana

Beverly Ethridge
U.S. Environmental Protection Agency
Dallas, Texas

J. Wendell Gilliam
NRC Committee Member
North Carolina State University

Ron Harrell
Louisiana Farm Bureau Federation
Baton Rouge, Louisiana

Curtis Hopkins
Ducks Unlimited
Memphis, Tennessee

Jerry Hogan
USDA Soil Conservation Service
Harrisburg, Arkansas

Marlin Jordan
USDA Soil Conservation Service
Monroe, Louisiana

Calvin King
Arkansas Land and Farm Corporation
Brinkley, Arkansas

Gale Martin
Mississippi Soil and Water
Conservation Commission
Jackson, Mississippi

Ronnie Murphy
USDA Soil Conservation Service
Little Rock, Arkansas

Mark Monroe
Anderson-Tully Company
Vicksburg, Mississippi

Bill Rainwater
Rainwater Enterprises
Jonesboro, Arkansas

B.A. Bob Stewart
NRC Committee Member
West Texas A&M University

Bob Strader
U.S. Fish Wildlife Service
Jackson, Mississippi

Jim Whitfield
Yazoo City, Mississippi

Paul W. Johnson

Mr. Chairman, and Members of the Subcommittee: Thank you for the opportunity to discuss with you the recent National Research Council report entitled *Soil and Water Quality—An Agenda for Agriculture*. This is my first opportunity to testify before Congress since being named Chief of the Soil Conservation Service, and I can think of no better way to begin.

This is an area to which I have devoted a great deal of my life. I am a farmer by trade and inclination and have been active in conservation issues for several decades. As a former State legislator in Iowa, I was fortunate enough to have sponsored groundwater protection legislation which was enacted and is now making a positive difference in the quality of Iowa's water.

I was also on the Board on Agricultural for the National Research Council (NRC) when this report was initiated and have followed its progress with great interest. The report's findings and recommendations are thoughtful and carefully researched. They were developed using the best information available and have been scrutinized and reviewed by some of the finest agricultural scientists and leaders in the country.

I should mention here that USDA Deputy Secretary Rominger served on the committee that produced this report for the National Research Council. He wanted to be here with you today to testify, and expresses his regret that this was not possible.

Mr. Chairman, I believe the issues raised by the report, and the recommendations offered, have merit and are worthy of your consideration, because how we deal with these issues will have tremendous ramifications for the future health and sustainability of our natural resources. They are the key to our agricultural systems, future food supply, and sustained environmental quality.

Without question, soil and water quality are interlinked issues. The quality of soil and water in a watershed is influenced by the way we farm and ranch. Preventing water quality problems from nutrients, pesticides, salts, sediments, bacteria, or other pollutants will be difficult and more expensive if soil quality is not maintained.

In recognition of this, the NRC report is based on three basic concepts that should find widespread acceptance. Namely, the fundamental importance of soil and how its condition affects water quality; the importance of preventing environmental problems rather than continually spending our resources on cleaning up problems; and the recognition that we must keep our agriculture both profitable and productive in order to meet the needs of our society.

In order to prevent soil degradation and water pollution and still maintain profitable agricultural systems, the report recommends four approaches:

> "(1) conserve and enhance soil quality as a fundamental first step to environmental improvement; (2) increase nutrient, pesticide, and irrigation use efficiencies in farming operations; (3) increase resistance of farming systems to erosion and runoff; and (4) make greater use of field and landscape buffer zones."

Of these recommendations, two are unique to this report: conserving and enhancing soil quality (with soil recognized as an important part of the ecosystem) and using landscape buffer zones.

Soil and water are basic resources along with air, plants and animals, and we consider them as critical resources at this time. Soil is the mediator between farming practices, agricultural chemicals and fertilizers, and the environment. Farming systems exist within a landscape, and landscape processes determine the ultimate effects of farming systems on soil and water quality. Consequently, we agree that the conservation and enhancement of soil quality is a basic component of environmental protection.

Water is the mediator that interconnects these basic resources, promotes life processes, transports pollutants (directly and indirectly), and contributes to higher level quality issues such as wildlife habitat. Consequently, soil and water are inseparable.

Overall, the report affirms that we are on the right track with steps taken by the Soil Conservation Service (SCS) over the past 2 to 3 years. The agency is poised to move in the directions outlined in the report. In fact, it is interesting that many of the recommendations outlined in the report have their genesis in early conservation work undertaken by the SCS back in the 1930's, 1940's, and 1950's when we first began our work in soil management and watershed protection.

Within USDA, the Forest Service and the SCS are adopting an ecosystem approach as a means of addressing the interactions among natural resources soil, water, air, plant, animal and human considerations. The programs managed by these agencies will now be delivered based upon ecosystem principles and proc-

esses. Providing ecosystem based technical assistance will enhance our effectiveness by giving greater consideration to the interactions of the resources our Nation holds in common.

Some specific recommendations of the report merit discussion. The report strongly favors voluntary approaches; however, it does recognize that in some cases nonvoluntary solutions may be necessary. This is because improving soil and water quality to the levels needed to adequately sustain them will require some changes in attitude and behavior. We support this recommendation and our experience shows that solutions which come from the bottom up, rather than the top down, work best. Local solutions and local controls, working with appropriate standards that are set at the Federal and State level, with stakeholder involvement, are preferable.

Other recommendations that we support include the "targeting" or focusing of programs to high priority areas and enterprises where appropriate; the development of integrated farming systems and their use as the basis for financial assistance and program compliance; developing cost-effective diagnostic and monitoring methods for managing soils and inputs; better record keeping by users of pesticides and plant nutrients; new research into economically viable sustainable cropping systems; and joint USDA and Environmental Protection Agency (EPA) efforts to develop better standards for evaluating farming systems.

The report also suggests that stronger Federal support of natural resource programs is needed and that Federal policies and procedures should not discourage, or even obstruct, approaches to solving environmental concerns. In this respect, it recommends that Federal agricultural price support and supply control programs should continue to be reformed to increase the flexibility producers have to diversify their cropping systems.

The report places an emphasis on market incentives, the use of both profit and nonprofit entities for information sources, and the need for increased cooperation between EPA and USDA. This is particularly relevant as the Clean Water Act will be before Congress for reauthorization this year.

A recurring theme throughout the report is the need for balanced and broad understanding of the complexities of the environment. The report cautions that there must be balance among objectives; for emphasis on one objective to the exclusion of the others may exacerbate one or more environmental problems while solving only one. Our resources must be viewed as a "package"—a system—and the interrelated effects of human manipulation on these resources considered as an integrating whole.

Further, there is recognition that the balance will likely change from one region to another in response to local conditions. For example, in some cases, erosion itself is not the greatest threat to soil quality, but instead it is salinization, compaction, acidification, or the loss of biological activity. Any policy on soil degradation must be comprehensive and address all aspects of the soil ecosystem.

One question that we must answer in the Federal sector is what can we do differently? Can we refocus or combine existing programs to address the issues raised by the report? We know we need to do more, and do it faster, but what is the best way to go about that process? One program which provides an opportunity is the National Resources Inventory which could be expanded to include additional indicators of soil and water quality.

We believe that increasing our partnerships with the private and public sector and equipping ourselves to better manage and share information offer great hope in expanding the availability of educational and technical assistance.

We also recognize the need to incorporate the buffer zone concept into our planning process, and we will act to get this into our manuals and field office technical guides. It is worth mentioning that this approach merits further consideration within the context of the 1995 Farm Bill. SCS also manages 25 Plant Materials Centers that have made important contributions in the search for better plants for conservation purposes. We feel these centers have great potential to further the buffer zone concept.

In our Conservation Management System concept, it is proposed that we need to move toward performance standards, in addition to our design standards. We will allow more flexibility in designing conservation systems, and encourage our field employees to use innovative ideas. This is in keeping with our interest in finding regional, and local solutions to problems at those levels.

Overall, the report provides us with a scientific and common sense blueprint we can use as we enter the reauthorization of the Clean Water Act, the 1995 Farm Bill, or evaluate the need and consequences of separate soil quality legislation. Before we base any national legislation on soil health indicators, however, we need to be certain that we are comfortable with the indicators and their integrity.

Soil scientists continue to debate what constitutes, and how to measure, good soil quality. We will continue to work with the research community to develop reliable indicators of soil quality.

In conclusion, we offer strong support for the report and the recommendations it contains. Protecting soil quality, like protecting air or water quality, should be a fundamental goal of National environmental and agricultural policy. We are committed to providing assistance to private landowners to help them become even better stewards of the natural resources with which we are entrusted. The lessons of the past 50 years should not have to be relearned by succeeding generations.

USDA's goal is to deliver an agricultural system that produces food and fiber for the Nation and the world, while at the same time enhancing our environment. With the assistance of this subcommittee and the United States Congress, that goal can become a reality. I appreciate the opportunity to testify today and will be happy to respond to your questions.

Robert W. Wayland

Good morning, Mr. Chairman, and Members of the Subcommittee. I am Bob Wayland, Director of the Office of Wetlands, Oceans and Watersheds within the United States Environmental Protection Agency's (EPA) Office of Water. Thank you for the opportunity to testify before you and discuss with you the recent National Research Council report entitled *Soil and Water Quality—An Agenda for Agriculture.*

We at EPA commend the National Research Council's Board on Agriculture for producing this timely and excellent report. The report was written and reviewed by some of this country's most widely respected experts in the fields of agriculture, soils science, and water quality. Their compilation and review of available information, together with their cogently reasoned recommendations, have combined to produce a volume that can be fully expected to play an important and highly influential role in all future discussions of these important issues for many years to come.

This report arrives at a time when the interdependence of agriculture soil, and water quality is becoming increasingly recognized, if not yet fully understood. For example, in the area of water quality, beginning in 1972, Congress directed EPA and the States to focus both regulatory attention and huge financial resources upon point source discharges, such as those from factories and sewage treatment plants. As a result, we have made great strides in cleaning up those discharges. Today, after more than 20 years of Clean Water Act implementation, we find that the major remaining types of pollution are from nonpoint sources; the most dominant and widespread nonpoint source category of concern is agriculture; and the most dominant pollutants responsible for remaining water pollution problems in the United States are sediment and nutrients—both of which are attributable to a very large extent to agricultural runoff.

States have reported that agriculture affects about two-thirds of all impaired river miles and contributes to about one-half of all impaired lake acres. The United States Department of Agriculture's (USDA's) second Resource Conservation Act appraisal of conditions and trends on non-Federal lands reported that agricultural nonpoint sources of pollution are degrading water quality in about 30 percent of all streams. Some studies have also documented that agricultural nonpoint source pollution affects ground water as well.

In light of this and other corroborating information detailed in its report, the national Research Council recommends the following 4-point agenda that, if implemented, would make great strides in protecting and restoring soil and water quality:

> "National policy should seek to (1) conserve and enhance soil quality as a fundamental first step to environmental improvement; (2) increase nutrient, pesticide, and irrigation use efficiencies in farming systems; (3) increase the resistance of farming systems to erosion and runoff; and (4) make greater use of field and landscape buffer zones."

EPA agrees with these recommendations. Indeed, much of our nonpoint source program for reducing agricultural pollution of our waterway centers on achieving these goals. In the remainder of my remarks, I would like to note some of the programs and activities at the Federal, State, and local level to achieve these goals, as well as indicate potential future directions to improve our Nation's efforts.

EPA's primary program for dealing with the relationship between agriculture and water quality is the nonpoint source program established by Congress in 1987 under Section 319 of the Clean Water Act. Under this program, each State developed a nonpoint source assessment report that summarizes available information on the

source categories and locations of nonpoint pollution in the State. Second, each State then developed a nonpoint source management program designed to address those sources identified in the assessment report. The State programs address these sources through a variety of means, including technical and financial assistance, demonstration projects, information and education, and regulatory approaches.

EPA has approved all of these State management programs, which were developed with a great deal of involvement by members of the agricultural community, including USDA, State soil and water conservation agencies, local conservation districts, and citizens. They drew heavily upon existing Federal, State, and local programs and funding sources, while ensuring a specific focus upon water quality aspects of those programs.

In Fiscal Years 1990–1994, Congress has appropriated over $270 million for States to implement their nonpoint source management programs. At least one half of these funds have been spent to support programs and projects that address agricultural nonpoint source pollution. In implementing these projects, it is important to note the critical role played by USDA's agencies, especially its field personnel, as well as by numerous State conservation staff and local conservation districts in the implementation of these programs and projects. I would especially like to thank Paul Johnson, the new Chief of the Soil Conservation Service (SCS), for the tremendous assistance provided by the SCS in many of these projects; SCS's field presence has been invaluable in assuring their effective implementation.

Indeed, it has been especially gratifying to see that in most cases, Section 319 funds have been combined with funds from USDA and other agencies and private citizens to implement jointly managed projects. For example, State nonpoint source programs have contributed staff and funding assistance to many projects that have also been supported by USDA as part of its Water Quality Initiative.

It is significant to note that most of the agriculture programs and projects supported by Section 319 funding address the very concerns identified as priorities in the National Research Council report: nutrient management (including both fertilizer application and manure management); pest management (including the promotion and demonstration of integrated pest management practices); irrigation management; erosion control; and riparian buffers. It is equally significant that many of these measures can be implemented in a cost-effective manner; indeed, in some cases, cost savings from reduced inputs offset the costs of implementation. We believe that by working together cooperatively with agricultural producers, EPA and USDA can make significant progress in effectuating the goals of the report and reducing nonpoint source pollution in a manner that is compatible with the continued economic vitality of American agriculture.

EPA and USDA have worked together closely on a variety of cooperative activities to promote sound agricultural practices that protect water quality. These include development of new State coastal nonpoint pollution control programs under the Coastal Zone Act Reauthorization Amendments of 1990, under which USDA and EPA worked together to develop management measures for agricultural nonpoint sources that are very closely aligned with the practices recommended in the National Research Council report; joint publication of a draft Agricultural Pollution Prevention Strategy that again focuses on much of the same areas as are addressed in the National Research Council report; and a new EPA/USDA/FDA initiative to reduce pesticide use and promote sustainable agriculture. EPA and USDA have engaged in numerous other activities in concert with or in support of our State, local and private-sector partners, to promote sound nonpoint source management, including joint sponsorship of national nutrient and pest management conferences, technical efforts to improve nutrient management test methods, cooperative research efforts and promotion of a certified crop application program.

As my remarks indicate, solving our Nation's remaining water quality problems will require much more than Federal action. We must continue to look to States and local government, universities, and the private sector, for opportunities to improve control of nonpoint source pollution. In this regard, some very positive signs of progress are being reported. Here are a few examples:

- USDA fertilizer use statistics show that Iowa's nitrogen fertilizer use decreased by 17 percent between 1987 and 1992, while at the same time attaining a new State average yield record in 1992. In Pennsylvania, for the 36 percent of farmers who adopted new, well-calibrated fertilizer recommendations, nitrogen fertilizer applications decreased by 40 percent. Such reductions can actually save the farmers money while at the same time protect both surface and ground water quality from the problems associated with excess nutrients.

The Conservation Technology Information Center reports that in 1993, 35 percent of acres were farmed using conservation tillage techniques. This is up from 25 percent in 1989.

• Several large poultry integrators have developed active programs and policies to assure that their supplier-farmers meet certain minimum environmental standards with regard to poultry waste, such as the safe composting of dead chickens. Still other animal producing groups have held national symposia and published documents to promote sound animal waste management. These steps will help reduce impacts to our surface waters from excessive bacteria and algae.

• The use of integrated pest management systems that target pesticide use more carefully to meet crop needs has increased in recent years. While much of the progress has been made with respect to insecticides for cotton and some fruits, the development of herbicide banding (a practice by which an herbicide is applied only to the crop rows rather than broadcast over the entire field) and other techniques is also beginning to increase herbicide use efficiency in other major commodity crops such as corn, soybeans, and wheat. These techniques will help minimize the environmental distribution of chemical pollutants in a manner that is compatible with profitable agricultural production.

The challenge we face today is how to capitalize on these and other similar developments, accelerate the progress being made today, and assure the adoption of these and other cost-effective, environmentally protective methods where necessary to protect water quality. We will need to consider the broad range of tools available, including information and education, demonstration projects, the creation or improvement of financial incentives and disincentives, and, where appropriate, backup State regulatory authorities.

We note that there will be significant opportunities to reexamine and improve the efficacy of both EPA's and USDA's programs to more successfully address the types of issues and recommendations contained in the NRC report. One such opportunity arises with Congressional consideration of reauthorization of the Clean Water Act. In this context, we believe that the following principles should guide our approach to reducing nonpoint source pollution:

• A strong watershed and ecosystem focus should be brought to bear so that farmers and other stakeholders can better understand the connection between what they do on the land and the benefits they can help to bring to water quality.

• Where feasible, pollution prevention should be the approach of first choice for addressing nonpoint source pollution.

• Voluntary approaches should remain the primary focus, but backup enforcement requirements at the State and Federal levels are needed when voluntary approaches fail to produce adequate incentives and necessary voluntary improvements.

• EPA should, in concert with USDA and other partners, help to set clearer performance expectations and technical baselines for nonpoint source controls and management practices.

• We should encourage innovation where appropriate, including public-private partnerships and greater use of market-based incentives.

An additional opportunity to address some of the recommendations in the NRC report is likely to arise in the context of the 1995 Farm Bill. This will afford the opportunity to consider the NRC's recommendations concerning the relationship between soil and water quality programs and price support, supply control or income support mechanisms; options for retooling the conservation reserve program to address critical riparian areas; and other key issues.

Overall, EPA is very supportive of the NRC report and its recommendations. It is based on objective scientific data as well as common sense, and should prove to be very useful to us and to Members of the Congress as we consider the best ways to promote sound management and protection of soil and water quality.

EPA's goal is to protect our water quality while at the same time assuring the continued vitality of American agriculture. We look forward to continuing to work with Congress, USDA and other Federal, State, and local agencies, and agricultural producers to meet this challenge. I appreciate the opportunity to testify today and will be happy to respond to your questions.

Calvin O. Qualset

As president of the American Society of Agronomy (ASA), I am pleased to have this opportunity to submit written testimony for the report *Soil Water Quality: An Agenda for Agriculture*. ASA commends the Board on Agriculture, NRC, and the Committee on Long–Range Soil and Water Conservation as architects of this comprehensive, authoritative and well documented report. We wish to comment in reference to the section on policy instruments of the Executive Summary, and specifically on the concept of technical assistance on page 15 concerning:

"Mechanisms should be developed to augment public sector efforts to deliver technical assistance with nonpublic sector channels and to d/certify the quality of technical assistance provided through these channels."

As a scientific professional society, ASA was founded in 1907 with over 12,500 members located in all 50 States and 115 countries. It is dedicated to fostering research, communications, education, high standards, and professionalism among people working in, or otherwise interested in, agronomy and related activities. ASA is very much a grassroots organization that relies on its membership to set its priorities. In 1990, the segment of the ASA membership (extension, agribusiness, and private consultants) that works in the area of production agriculture began to focus on agriculture's responsibility to address environmental issues. The result was the Certified Crop Adviser Program.

The Certified Crop Adviser (CCA) Program is a voluntary certification program organized under the auspices of ARCPACS: A Federation of Certifying Boards in Agriculture, Biology, Earth and Environmental Sciences, and is a membership service of ASA. The goal of the CCA program is to provide farmers with advisers who have certified skills in the area of integrated farm management. The adviser certified by the CCA program will act as a conduit of information to farmers. CCA advisers are knowledgeable ill information ranging from technical production to the latest regulations, but to be in the position to extend this information, they must have access to it. It will be crucial for State, and Federal agencies, and the land grant universities to develop programs that target the certified crop advisers. Crop advisers ill the CCA program will be required to take 30 hours per year of continuing education, equivalent to 30 Continuing Education Units (CEU), to maintain their certification.

By targeting crop advisers through their CEU program, the agencies and universities will be using the individuals who farmers traditionally rely on for most of their information. For example, to help farmers implement the integrated pest management (IPM) program objectives, the most efficient manner to transmit that information to the farm is through certified crop advisers. By targeting crop advisers in their educational activities, IPM state coordinators will actually be reaching the 20 to 80 farmers each adviser contacts through his or her normal routine.

We believe that preserving and protecting natural resources relies on farmers having access to professional and dedicated crop advisers. Certification programs in other fields have been very successful, ensuring that the public receives high quality service. As a national program, the CCA program establishes the base standard for crop advisers. The program has built into its guidelines, procedures to make sure that the CCA program standards match the needs of farmers and public policy. The leadership of CCA views the program as an evolving one that will benefit from its review by agencies, nongovernment agencies, and the private sector.

The concept of a broad based certification program is new to agriculture. As the CCA program grows, a strong cooperative partnership between the private and public sectors will be needed to provide the CCA advisers with the information needed to bring about sound environmental decision making on the farm. The more than 6,000 women and men that are working as crop advisers in 25 States who have taken the CCA examinations to date are evidence of the excitement the CCA program has caused. This group will make an impact on agriculture. The size of the impact will be determined by the educational support they receive.

The success of the program to date, and in the future, has been due in part to the support and encouragement provided by the U.S. Department of Agriculture, particularly the Soil Conservation Service and the Cooperative Extension Service; and the Environmental Protection Agency. As USDA and other agencies continue to restructure to increase efficiency, we strongly believe by providing supporting programs for crop advisers they can make a large impact on improving environmental quality.

We thank you for the opportunity to provide this written testimony about the Certified Crop Adviser Program, a membership service of the American Society of Agronomy. Please contact Robert F. Barnes, executive ice president, ASA, 677 South Segoe Road, Madison, Wisconsin 53711, phone (608) 273–8080, Fax 608/273–202, if the committee has any questions about the CCA program.

Larry P. Wilding

As president of the Soil Science Society of America and on behalf of this organization, I am pleased to have this opportunity to submit written testimony for the report *Soil Water Quality: An Agenda for Agriculture.*

The Soil Science Society of America (SSSA) is a professional society with over 6,300 members. It is dedicated to the advancement of soil science, technology and education in the areas of crop production, environmental quality protection, ecosystem sustainability, bioremediation, waste management and recycling, and wise land use. The organization was established in 1936, with current representation from over 100 countries. Dissemination of research and education materials are through leading referred journals of the SSSA and sister societies (American Society of Agronomy and Crop Science Society of America). The publications include the Soil Science Society of America Journal, Agronomy Journal, Journal of Environmental Quality, Jour Production Agriculture, Crop Science, and Journals of Natural Resources and Life Sciences. In addition, numerous special publications are published by the Societies. The SSSA embraces 10 divisions as disciplines in soil science with the Wetlands division recently added in a provisional status.

The SSSA commends the Board on Agriculture, NRC, and the Committee on Long-Range Soil and Water Conservation as architects of this comprehensive, authoritative and well documented report. It is worthy to note that eight of the committee members are SSSA members, two of these have served as President of the SSSA and six of them are Fellows of this Society. This is to further attest to their expertise and authority in this discipline area.

The SSSA concurs and is strongly committed to the basic concepts and agenda highlighted in the NRC report. It is pleasing to note that the quality of soil resources are recognized, interactivity with air and water resources, as one of the fundamental components of the earth science system controlling environmental quality of the global ecosystem. More specifically, our profession views soil and land resources as undergirding other renewable natural resources so germane to the well being of agriculture and human existence. Sustaining land quality, minimizing soil erosion and wise use of land resources are global mandates. The complexity of the biosphere and its interconnectivity are nicely elucidated in this report. It focuses recommendations on action plans at the "grass roots" level of nonpoint source agricultural pollution.

We concur with the basic concept planks of the report that recommend the following national policy goals:

- "Protecting soil quality, like protecting air and water quality, should be a fundamental goal of national environmental policy."
- "Preventing surface water and groundwater pollution by reducing the sources of contamination by nutrients, pesticides, sediments, salts, and trace elements should be the goal of national policies."
- "National policies should take advantage of opportunities to protect soil and water quality while sustaining profitable production of food and fiber."

The report stresses the need for a better educational delivery system to producers so that the current knowledge base is more effectively utilized. While we concur that efficient and effective utilization of current technologies for soil water and quality enhancement and protection are in order, we would further emphasize that maintaining a continuing program for foundational knowledge in this area is a critical national priority. Basic research is fundamental to technology development and long-term economic success. Our Society has long been an advocate for strengthening the American scientific base. Science has been the engine of America's well being for the past half century. We are very pleased with the new initiative *Soils and the Soil Biology* under the Natural Resources and Environment area of NRI. This initiative will address these above priority national issues. A balance between fundamental and mission research thrusts is needed for sustained viability in soil and water quality protection programs. Who knows what the questions or issues of future generations may be?

We concur that a systems approach for technology transfer is most germane. We also agree that technical solutions must be developed and balanced with indigenous producer knowledge, site-specific conditions, and in context with political, social and economic realities. Local knowledge bases and expert systems will help extrapolate the hard scientific knowledge base to local conditions without such information.

Recurrent themes throughout the NRC report argue the importance of voluntary compliance programs with local import. We concur that a "bottom-up" approach is not only most appealing to producers, but also the most effective. However, the need for non-voluntary programs may be needed in problem target areas and/or farms. Targeting of such problem areas is absolutely essential because of the regional and local diversity in soils, topography, geology, hydrology, climate, cropping systems, land-use intensity, etc. While the major local control emphasized in the NRC report was at the field scale, "farming by soils rather than fields" in a watershed system is the new era of potential technology development. Here, sophisticated geographic

information systems, global positioning systems and computer hardware/software interlinkage to applicator equipment results in inputs that are conditioned by soil-quality specifics. Yield mapping of fields may provide the plant response indicator to specific soil fertility constraints and serve as the basis for determining where detailed soil testing is needed in this concept of farming by soils. Hence, soil-quality tailored practices substitute for field-scale efforts to enhance soil and water quality protection and improve input use efficiency.

Targeting problem areas could be expedited by the USDA, EPA and U.S. Congress by making more effective utilization of published county soil survey inventories provided through national cooperative efforts of the USDA–Soil Conservation Service and the State Agricultural Experiment Stations. These soil inventories identify the geographic distribution, quality and extent of soil resources on private and some public lands in the United States. They provide a basis to identify regions and watersheds that are critical target problem areas. Digitization of these soil survey maps for geographic and tabular data base analyses are constrained by the lack of ortho-photobase maps for much of the country. They are either cost-prohibitive or unavailable for purchase. *Hence, it is recommended that the Administrators of the USDA, EPA, DOE and DOI national agencies with U.S. Congress and the American Geological Institute undertake a coordinated effort to procure ortho-photobase maps of the United States where such base maps are not currently available.* This will enhance integration of soil hydrological, geological, vegetative, topography and other natural resource spacial data bases into a Geographic Information System analyses. Such an approach would provide the geographic basis to identify problem soil and water target areas.

Biological control measures such as buffer zones represent a technology alternative with broad potential for adoption and adaptability in a cost-effective manner. These will need integration into a soil-and-topographic-based holistic landscape system approach. Likewise, buffer zone controls will require considerable producer cooperation and coordination because they traverse field and property boundaries. Considerable opportunity exists to couple physical (structural) and biological control (buffer zones) practices. Research that identifies the best plant vegetative species with physical control geometries will augment such management strategies. We view this approach as very proactive and positive.

Evaluation of progress in abating soil quality and water degradation continues to be a challenge for the future. For success, it will require vigorous research and coordination efforts among the allied scientific disciplines, professional societies and local, State, and Federal agencies. The first requirement will be to establish definable levels and goals of acceptable soil and water quality. Quantifiable standards can then be used to evaluate farming systems management strategies that are used to attain these standards. This is a formidable task, the fruits of which will not come easily or rapidly. The theme "together we can" provides the mutuality for public and private partnerships in this regards. Hopefully this approach will reduce polarization among producers, environmentalists and concerned public.

Enhancing the public understanding and scientific literacy of earth science processes will engender a better appreciation of the purpose and benefits of soil and water quality protection. Such opportunities can be realized through continuing education and primary/secondary K–12 education programs. The American Geological Institute (AGI) has been active in development of such earth-science programs for the past decade. Recently the Soil Science Society of America has joined AGI in such a program for the K–6 educational levels. Education of the future leaders of this country in near surface soil/geological processes will illustrate the importance of soil and water quality as fundamental ecological component in the drive to sustain life on this planet. This program would be directly germane to the NRC report.

Issues of property rights versus societal mandates continue to polarize urban/rural populace. These legal and social issues need clarification for consistent and uniform implementation plans for soil and water quality protection efforts.

We concur with the NRC report consensus that prevention of nonpoint source pollution must be the primary strategy rather than remediation of polluted soil and water quality. It follows the adage that "an ounce of prevention is worth a pound of cure." The precise technologies needed as an early warning system for soil quality are yet unknown, but in addition to routine physical and chemical properties, soil biology will need to be an important component. Future strategies to enhance soil and water quality protection will likely involve development of new vegetative species that can adapt to and overcome a number of soil physical and chemical constraints. Integration of biotechnology specialists and soil scientists will enhance this endeavor. Management tools that keep the surface covered by alternative conservation crops or residue management will continue to be a strong focus in conservation practices.

We commend the close liaison and interlinkages of personnel and policies from Federal and State agencies representing the USDA, EPA, and DO in their positive actions to fulfill the agenda of the NRC report. It will require strong cooperative efforts on behalf of these and other institutions and entities before fruition in soil and water quality goals are reached.

In closing, the Soil Science Society of America stands ready to assist the National Academy of Sciences in this acute national priority—soil and water quality. As a scientific organization we are actively pursuing mechanisms to better deliver our professional expertise and service to our membership and to ancillary disciplines. The concepts, agenda and recommendations outlined in the report *Soil and Water Quality: An Agenda for Agriculture,* are directly germane to many of the priority research, education and service programs issues of our Society. These include among others:

(1) Workshops and Outreach activities to provide continuing education opportunities to soil science practitioners in areas of biodegradation, wetlands, degradation of soil and water quality, etc.

(2) Establishment of Special Liaison Representatives to other professional societies to interlink overlapping programmatic activities, enhance multidisciplinary interaction arid foster greater internationalization (*e.g.*, Society for Range Management, American Forage and Grasslands Council, Soil and Water Conservation Society, International Soil Science Society, Ecological Society of America, American Geophysical Union, American Society of Agricultural Engineers, Geological Society of America, American Chemical Society, American Geological Institute, Coalition for Earth Science Education and American Association for Advancement of Science, Council for Agricultural Science and Technology, etc.).

(3) Establishment of a professional registry (ARCPACS) that certifies expertise in multiple plant and soil science disciplines for soil and crop consultants.

(4) Support of Congressional Science Fellows, such as Dr. Tracey Henderson, who has assisted Senator Daschle in organizing and conducting this hearing before the U.S. Senate Subcommittee on Agricultural Research, Conservation, Forestry and General Legislation.

(5) Providing lists of expert witnesses for congressional testimony on issues of soil and water quality through our National Issue Response Committee.

(6) Advertisement of soil and water quality issues, co-sponsored meetings, workshops and conferences through Agronomy News.

(7) Dissemination of research, education and service materials covering soil and water quality issues through society journals and special publications.

Again, I would like to thank the Chairman, and Members of the Subcommittee for this opportunity to provide written testimony. I would be pleased to answer any questions you may have about these comments.

SENATOR DASCHLE'S QUESTIONS SUBMITTED TO WITNESSES WITH RESPONSES THERETO FROM:

Dr. Sandra S. Batie

Reference: The report emphasizes the need to develop a comprehensive policy which goes beyond the current emphasis on soil erosion and deals with the others aspects of soil degradation and the interaction between soil and water quality.

Question 1. What needs to be done in terms of policy to achieve the goals outlined in the report? Specifically, what goals can be accomplished now through the administrative process, and what will require legislation?

Answer. The report had several comments with respect to this issue. The committee felt there was a critical need to assemble information with respect to current soil quality conditions. The committee recommended that the Secretary the United States Department of Agriculture and the Administrator of the Environmental Protection Agency initiate and coordinated research program to develop a minimum data set of soil quality indicators, standardized methods for their measurement, and standardized methods to quantify changes in soil quality. The committees' underlying motivation was to make operational the concept of soil quality so that it could better be used in a policy context and for improved soil management. The committee called for using the National Resources Inventory to quantify and to measure se-

lected soil quality indicators that are broadened to produce estimates of compaction, salinization, sodification, acidification, and biological degradation in addition to erosion. The committee also recommended that the Resource Conservation Act appraisal process assemble all currently a available information to assess the current state of and trends in soil quality. To my knowledge these changes could be made administratively.

In addition, the committee recommended replacing the concept of best management practices with the concept of integrated farming systems. A best management farming system is not limited in scope to the producer's choice technology, but rather comprises the pattern and sequence of crops in space and time. The management decision regarding the inputs and production practices that are used, the management skills, education, objectives of the producer, the source and quality of information used by the producer, the quality of the soil and water, and the nature of the landscape and ecosystem within which agricultural production occurs. If producers are to change how they think about and use their resources, then public recommendations and guidance need to reflect a systems approach. A systems approach should accelerate the adoption of farming systems that are viable for producers, that conserve soil quality, and that do not degrade water quality.

Reference: There has been a good deal of discussion recently regarding the preparation of site-specific farm management plans to deal with environmental quality problems. Yet, the development of site-specific plans could prove very costly, and would require a great deal of personnel and expertise.

Question 2. Do you think that site-specific farm plans are essential for a successful soil and water quality program? If so, can you explain how site-specific farm plans would work? For example, who would administer them? Is each plan a joint decision between the lead agency and the farmer? Will a committee review the plan? Who monitors compliance, and how? Are enough personnel with the necessary technical expertise available, or will extensive training and hiring of new staff be necessary?

Answer. There seems to be some confusion about what the committee meant by an integrated farming system plan. Some people are assuming that what we recommended was either a site specific set of precision farming techniques that allow farmers to manage their soil on a foot by foot basis with an "on-the-go" technology. Others seem to think the committee was thinking of immense thick documents detailing farming practice specifications per farm. Neither assumption is accurate. The committee was envisioning a far simpler, far more targeted, integrated farm ing plan.

Before clarifying the committee's perception of an integrated farm plan, let me address precision farming on a site specific basis. Much of what follows on this topic is not in the committee's report. There is currently a newly emerging technology of smart tractors and other technology, that assess variability in the field on a grid basis (foot by foot)—as opposed to a farm, field or soil basis. Many commercial farmers are exploring the possibility of adopting this technology, and new crop consultant specialists are emerging to assist the producer in making the transition. Despite these trends, it is my opinion that we are not yet at a point where such technology can be incorporated into environmental policy. There has not been much research in this area, and what has been done has focused on the profitability of the technology and not its impact on either soil or water quality (nor for that matter, have researchers estimated the impact of this technology on the profitability of the small or moderate size farm). Thus, the evaluation of cite specific management is rudimentary. There are no standards of appropriate technology to apply, nor is there knowledge currently on how this technology will be incorporated into current farming systems. There is also an additional complication with respect to the legality of a concept patent with respect to site-specific plans based on grid management technique. Depending on litigation outcomes and interpretations the concept of site-specific, grid management may be proprietary. Such an out one might put legislation that required or encouraged grid management and global positioning technology in the awkward situation of directing business to a single private company.

In any case, while there is certainly an intuitive appeal to precision farming for achieving profitability and environmental goals, we are not yet at a point where such newly emerging technology should be or could be successfully incorporated into environmental policy. Nevertheless, it may be appropriate to begin pilot programs to investigate the use of these technologies to achieve environmental goals. There is work currently underway at some institutions with respect to precision farming. There is for example, a North central Research Committee NCR–180 on Site Specific Management (chaired by Pierre Robert of the University Minnesota) that is investigating this area. This work could be accelerated. Furthermore, there is need,

in my opinion, for coordination among the various agencies and universities with expertise and interest in this topic.

Such precision farming was not what was envisioned in the committee report when we recommended the use of in integrated farm system plan. An integrated farm system plan begins with an inventory of farm resources and answers such questions as:

- Are there opportunities to improve pest, nutrient, or soil management through crop rotation?
- Are there livestock enterprises on the farm or nearby farms from which animal manures might be collected and used as nutrient inputs?
- Does the producer participate in U.S. farm commodity programs?
- Where is the producer getting information on which to base his or her decisions and how is it being used?

Once a general picture of the farm enterprise emerges, more detailed information on production practices and information sources can then be assembled. For example answers to the following questions might be pursued:

- What is the crop rotation history on a field by field basis?
- Are credits for the nitrogen fixed by legumes taken when making fertilizer applications?

This plan can then be used to recommend improvements that range from improved information sources to input adjustments. Further refinement can be made by assessing the soil resources within each field as the variability can be great.

Integrated farm system plane as conceived off by the committee, are not complex, but they do involve thinking of the whole farm as a system and taking note of horn the producer gathers information and makes decisions. It is the committees' opinion that if such plans were used to improve the management of problem farms in problem areas, there would be improved soil and water quality outcomes in most cases. Note that the plans are not technology based, rather they are information gathering, recommendation building exercises. They allow great flexibility to coordinate with individual enterprise characteristics. They provide information, not a specification of practices per se. Indeed in this context, the committee felt that such things as record keeping might be far more valuable than technology based standards.

The committee did not recommend that percent of U.S. farms should have an integrated farm system plan. As I emphasized earlier in my testimony, the committee recommends the concentration of agency resource to, what we termed, "problem areas and problem farms"—where the payoff from the use of these scarce resources are likely to be highest.

As to which agency would provide the lead and implementation strategies, the answers seem to depend on what are the goals and tools of the policy. For example, if the policy is based on cost sharing, presumably the plan would resemble more of a contract with enforcement mechanisms to insure that the dollars are spent as agreed to and that records are kept. Coordination would be required between USDA, EPA, and various State agencies. Clearly, if the agency resources are to be adequate, it will be necessary to target and prioritize.

The committee takes some pages in the report to discuss how local level capacity to undertake these efforts could be developed and how mechanisms to augment public sector efforts to deliver technical assistance with nonpublic sector channels such as private consultants and agribusiness concerns can be developed. We also recommended that the soil conservation service, in cooperation with the Cooperative Extension Service, undertake an accelerated training effort targeted at Federal, State, and local government personnel and at producers to develop and implement integrated farming system management plans.

Reference: The report strongly emphasized the importance of an integrated farming systems approach to soil and water quality planning. Conservation compliance programs are probably the most widespread type of on-farm conservation planning that exists at the present time.

Question 3. What role, if any, do you see for existing conservation compliance plans in an expanded "integrated farming systems" approach?

Answer. We note in the report that using the integrated farm system plan as the basis for conservation compliance will achieve some soil and water quality goals. Indeed, the committee recommends: that the development and implementation of approved integrated farming system plans should be the basis for deliver of educational and technical assistance, should be the condition under which producers become eligible for cost sharing dollars, and should be the basis for determining whether producers are complying with soil and water quality programs. We rec-

ommend that the integrated farm system plan replace the numerous plans and agreements that producers currently are required to have to participate in various Federal and State programs.

However, the conservation compliance features of the commodity programs are not always influencing farming on the lands most contributing to soil and water quality problems. Thus, the committee goes on to recommend that, in the long term, the implementation of an integrated farming system plans should be required for producers in regions where soil and water quality problems are severe regardless of their participation in Federal commodity programs.

Reference: The report indicated that a major problem is not a lack of technology, but the fact that more farmers aren't using the technology. You mentioned that the traditional technology transfer mechanisms are inadequate.

Question 4. What needs to he done to improve the transfer of these technologies to farmers? Do you think that the Sustainable Agriculture Research and Education program could serve as an effective model for technology transfer?

Answer. The current Sustainable Agriculture Research and Equation Program has much to recommend it when we are considering the need to demonstrate and evaluate new technology. As a testing ground for new ideas, this program has high scores. There may be come elements of the committee's recommendations that would benefit from such an approach, but much of the committee's recommendations have more to do with better "marketing" of existing concepts of improved farming, then it does about brand new technologies or concepts.

The committee recommended thinking about the producer as a consumer of information. Like any product, information can be "marketed." By that I mean, audiences can be segmented into groups that are differentiated by their different constraints, level of knowledge, choice of practices, access to resources, resource problems, and the like. Then, information programs which are tailored to these audiences' needs can be developed and delivered. Frankly, we can take some of our lessons from "Madison Avenue" techniques of demand analysis and market segmentation. Thus, the committee recommended that the Cooperative extension Service of the USDA should develop information and methods needed to segment target audiences and tailor an accelerated education program to selected audiences including producers, crop soil consultants, dealers who sell agricultural inputs as well as others who affect producers' decisions. Again, we are recommending that agencies prioritize these audiences so that there is a significant concentration of technical and informational assistance directed to those audiences where a change in agronomic behavior would most influence soil and water quality.

Reference: In your testimony you stated that one of the obstacles to change was a lack of information about why farmers make the choices they do.

Question 5. What kind of research needs to be done to be able to develop an effective program of technology transfer and farmer training?

Answer. Clearly, there is a substantial research agenda that stems from the "agenda for agriculture" that comprises the committee's report. Imperative research needs are the determination of why producers make the decisions they make and what are the production practices currently being implemented. The committee recommended that the Secretary at the USDA and the Administrator of the EPA initiate a multiagency effort to assemble currently available data on production practices and enterprise characteristic' to identify problem farms within priority areas for soil and water quality improvements. We further recommended that monitoring changes in production practices was an important element of this task. We then suggested the necessity of and methods for refining strategies to change producer behavior such as targeted information programs.

If we are to achieve soil and water quality goals, we need to change the way producers think a out these issues. We cannot accomplish this transformation by focusing on technology standards or recommended practices alone. We need to find out what information producers are using and how they are using it. This research endeavor is going require different survey instruments than before. We need to be asking not just "what pesticide did a producer use," or when and where was it used," but also "how did the producer decide to use this pesticide in this way." Until we have this information, it will be very difficult to change producer's thinking about their farming system or to ultimately have a long term influence on their decisions. Our report provides some insights into this type of approach, and the research implications are both significant and different from many research tasks we have undertaken in the past.

Robert H. Wayland

Reference: The report strongly emphasized the importance of an integrated farming systems approach to soil and water quality planning. Conservation compliance programs are probably the most widespread type of on-farm conservation planning that exists at the present time.

Question 1. What role, if any, do you see for existing conservation compliance plans in an expanded "integrated farming systems" approach?

Answer. Conservation compliance systems are one component of an integrated farming systems approach. They focus on reducing soil erosion on highly erodible croplands. The conservation compliance program was initiated under the 1985 Farm Bill; by 1995, all agricultural producers subject to the program should have plans in place and be in compliance with their plans.

These plans address soil which, when transported to waterways, can smother bottom—dwelling life and alter biological structures. The plans, however, are not directed towards other nonpoint sources of water pollution from agricultural land. These sources include nutrients applied to the land through the addition of fertilizers or manure; the storage and management of animal waste; the application of pesticides; grazing practices; and irrigation. All of these sources can, even at reduced levels, cause significant water pollution if inappropriately managed. Moreover, soil erosion can continue to contribute to water quality problems even where conservation compliance plans have been implemented to protect soil quality, as well as in instances where conservation compliance requirements do not apply (*e.g.*, non-commodity crops or non-highly erodible lands). In addition, as the NRC report notes, Conservation Compliance Plans do not address maintenance of soil quality, and, therefore, in many cases, may need to be supplemented by other policies.

Therefore, our view is that conservation compliance plans should form a starting point for soil erosion aspects of an integrated farming systems approach, but should be expanded upon as necessary to protect water quality.

Reference: The report mentioned a number of aspects of the soil and water quality problem that still require research.

Question 2. How would you prioritize the research needed to implement a comprehensive program to promote soil and water quality? How can USDA and EPA cooperate on conducting this kind of research initiative?

Answer. EPA sees several areas of the water quality problem as especially deserving of additional research and demonstration. Indeed, we believe that as much or even greater emphasis should be placed on the development and demonstration of promising methods of nonpoint source pollution control than on fundamental research. This is because some of the most important practices to protect water quality already exist, but are under-utilized, primarily because they have not been fully developed or disseminated.

A very high priority is the development and calibration of nutrient testing methods that are economical and timely for field use on a regional, state-wide or other appropriate basis. Several States (*e.g.*, Iowa, Pennsylvania and Maryland) have already developed soil-specific and plant nutrient recommendations that are capable of accurately crediting nutrients from crop residues, legumes, and manure. A number of State cooperative extension services, with financial assistance from USDA, are currently developing similar nutrient recommendations for other locations. We expect that prioritizing development of these methods will have significant water quality benefits, especially if conducted as highly focused problem-solving research.

Another area warranting continued research and development is the development of improved practices to properly and economically store animal waste and apply it to land as fertilizer. EPA and USDA have both funded projects in these areas (*e.g.*, new methods to compost dead chickens, and chicken wastes), and, given the significant effects of improper animal waste practices on water quality, it is important that such funding be continued. Similarly, more research is needed to improve our knowledge of the effectiveness of different types of filter or buffer strips, with respect to a variety of agricultural pollutants and in a variety of hydrogeological settings.

A third area warranting continued research and development is integrated pest management, including improved cultural practices (*e.g.*, banded applications of herbicides); various strategies that can reduce the need to apply pesticides (*e.g.*, scouting); and continued research into safer and better-targeted pesticides.

EPA, USDA, and others can work together to accomplish some of our mutual research goals. One example of cooperative research between USDA and EPA is the ongoing MASTER program, an joint inter–Agency agricultural R&D initiative that

is working to better understand the relationship between various agricultural practices controls and nonpoint source pollution, especially in mid-western contexts.

Reference: I understand that one cooperative research and education program between EPA and USDA already exists: the Agriculture in Concert with the Environment program. Yet, I hear that EPA cut its financial contribution to this program considerably for 1994, from $1 million to $650,000.

Question 3. Why did EPA cut the budget for this program? What does this mean for the future of this program, and what does this indicate about EPA's commitment to other such cooperative efforts?

Answer. For several years, the EPA has provided funds for the Agriculture in Concert with the Environment (ACE) program. In fiscal year 1993, EPA's contribution to this pollution prevention initiative was $900,000, and in fiscal year 1994 the contribution was reduced to $650,000. However, this very modest decrease is far outweighed by the increase in EPA's nonpoint source program from $50 million in fiscal year 1993 to $80 million in fiscal year 1994 and $100 million in 1995. This nonpoint source program funding has enabled the implementation of a large number of cooperative projects that include State water quality and agricultural agencies, local conservation districts, and other cooperators, as well as EPA and USDA. Many of these projects have the same goals and benefits of ACE projects, that is, promoting pollution prevention in agricultural operations to protect water quality.

Reference: In this time of deficit reduction and budget cuts, it is becoming increasingly difficult to find new money to fund Federal programs.

Question 4. Do you think individual farmers should have to pay for improvements they make on their farms to comply with environmental standards?

Answer. EPA believes that farmers should share in the expense of improvements they make on their farms to comply with environmental standards. As noted in the National Research Council's Soil and Water Quality report, many of the most significant water quality problems caused by agricultural practices can be addressed at little or no monetary cost to the farmer. These include nutrient management, pest management, and in many cases, erosion control. In many cases, such measures can reduce farmers' expenditures, albeit at a cost of more intensive and more skilled management.

The most expensive measures to be adopted by farmers are likely to be animal waste control measures. We believe that farmers will be able to implement these measures where necessary with technical assistance from USDA, EPA, States, and the private sector, supplemented by available financial assistance from many of these same sources.

Reference: There is currently a good deal of anxiety in the agricultural community about the pending reauthorization of the Clean Water Act and agriculture's role in reducing nonpoint source pollution. Frankly, one concern is that EPA has limited capabilities to address farming systems. The NRC report maintains that an integrated systems approach must be used to address the complex problem associated with soil and water quality.

Question 5. What would EPA need to do to move from the fairly narrow "best management practices" approach to the integrated systems approach described in the report? Does the Agency have any current plans to move in this direction?

Answer. EPA has already moved from a narrow "best management practices" approach to one that attempts to address the farm operation more holistically. For example, in our technical guidance published last year as required by the Coastal Zone Act Reauthorization Amendments of 1990, we included measures to address six areas: soil erosion, animal waste, nutrients, pesticides, grazing, and irrigation. The measures were written very broadly to provide the flexibility to develop cost-effective approaches that address, as a system, all of these elements that are applicable to the particular farmstead. Furthermore, in the Clinton Initiative, best available management measures would be targeted to threatened and impaired waters where States develop integrated watershed programs.

Our discussions with USDA make us confident that this approach to addressing water quality concerns on the farm is entirely consistent with an integrated systems—approach that addresses water quality as well as other farmstead concerns.

Reference: As we review this report, it is apparent that we will need a substantial commitment of resources, including Federal funding, to implement the recommended programs. My colleague, Senator Baucus, has introduced a bill that would provide significant Federal funds to address nonpoint source pollution. Specifically, S. 1114 authorizes $300 million for fiscal year 1995, $500 million for years

1996 through 1998, and $600 million for 1999 and 2000, for nonpoint source pollution, including agricultural sources.

Question 6. In order to better gauge EPA's commitment to addressing nonpoint source pollution, what level of appropriation is the EPA willing to support in its budget request for fiscal year 1995 and thereafter?

Answer. EPA supports increasing the level of resources available to States to implement their approved nonpoint source management programs. In 1994, the administration requested, and Congress appropriated, $80 million for this purpose, an increase of $30 million over the 1993 appropriation of $50 million.

For fiscal year 1995, the administration has requested an additional increase to a level of $ 100 million, reflecting the administration's commitment to the nonpoint source control program in the face of significant overall fiscal constraints. President Clinton's Clean Water Initiative, announced on January 31, 1994, seeks additional appropriations at a level of $100 million per year for fiscal years 1996–1998.

President Clinton's Water Quality Initiative will require leadership and support at the Federal, State, and local levels of government to address successfully the water quality issues identified by the NRC report. The appropriate agencies will need to be actively involved, providing assistance and guidance to those seeking to adopt changes designed to protect and restore water quality. The administration recognizes that Congress will need to be a partner in the effort to provide the necessary resources to work with the States as they address these water quality issues.

Paul W. Johnson

Reference: The report emphasizes the need to develop a comprehensive policy which goes beyond the current emphasis on soil erosion and deals with the other aspects of soil degradation and the interaction between soil and water quality.

Question 1. What needs to he done in terms of policy to achieve the goals outlined in the report? Specifically, what goals can he accomplished now through the administrative process, and what will require legislation? What types of legislation do you think we should be considering?

Answer. The report contains four opportunities which should he the goals of policies to protect soil and water quality:

1. to conserve and enhance soil quality as the first step to environmental improvement;
2. to increase the efficiency with which nutrients, pesticides, and irrigation water are used in agricultural production;
3. to increase the resistance of farming systems to erosion and runoff; and
4. to make better use of field and landscape buffers.

We believe that to some extent all four of these goals can he achieved using existing policy and we are pursuing that through existing programs. We recognize, however, that a broader type of soil quality legislation may he needed to fully address the National Research Council recommendations.

Reference: There has been a good deal of discussion recently regarding the preparation of site-specific farm management plans to deal with environmental quality problems.

Question 2. Do you think that site-specific farm plans are essential for a successful soil and water quality program?

Answer. Yes. A successful soil and water quality program depends upon addressing resource problems within the constraints of technology and economic viability, and upon the producer selecting a set of actions to treat or solve the problems. A comprehensive resource management plan for agricultural producers would not only simplify life for producers, but would also result in increased coordination and better environmental protection.

We believe that site-specific farm plans, developed through the SCS planning process, are the best way to provide for the full consideration of known and potential natural resource problems by the producer. The decisions of the producer can then be documented and scheduled in the site-specific plan. Further, and perhaps more dramatic, is the opportunity to work with the producer throughout the planning process to introduce and expand on new alternatives based on current science and management objectives.

Question 3. If so, can you explain how site-specific farm plans would work?

Answer. We believe that an integrated approach should guide USDA Conservation Planning efforts. Such an approach would identify natural resource problems

and opportunities on a watershed or regional basis and then incorporate the solutions on a site-specific basis. This would facilitate implementation of overall goals and management objectives for the entire watershed through development of individual plans incorporating management objectives for other resources such as wildlife and forest management.

We envision that the farmer would request assistance from USDA, and he given a priority for assistance based upon evidence of problems and likelihood of solution. USDA would provide technical assistance to the farmer to the degree necessary to address all of the identified natural resource problems. Several options would he developed that would meet the farmer's objectives and satisfy the resource treatment needs. This process would also expose the farmer to other State and Federal expertise that would result in the best information available, so they may make informed resource decisions. The option selected by the farmer would he documented in the site-specific plan, along with a schedule for implementation. We strongly believe that the plans he "farmer friendly," flexible, and environmentally responsive. We also recognize a key component in achieving success is the involvement and participation of landowners in the planning process.

Question 4. For example, who would administer them?

Answer. Because of the pending reorganization at this time it is impossible to specifically identify which agency in the Department would administer the site-specific plans. However, local conservation districts should he involved to ensure that the plans and selected actions were consistent with the overall needs and plans of the local area.

Question 5. Is each plan a joint decision between the lead agency and farmer?

Answer. Yes, although the farmer is the final decision maker.

Question 6. Will a committee review the plan?

Answer. Under the present USDA organization, SCS would likely monitor compliance, based upon an annual on-site review of a selected sample of the site-specific plans.

Question 7. Are enough personnel with the necessary technical expertise available, or will extensive training and hiring of new staff be necessary?

Answer. Whether or not enough personnel are available would be dependent on the time frame allowed for voluntarily developing a site-specific plan. Additional training will be necessary to assure field staff are technically competent to assist farmers develop the site-specific plans. We have learned, through such activities as conservation compliance, that if we are to deliver the program in the manner in which we understand Congress intends, we would need additional resources.

Reference. The report strongly emphasized the importance of an integrated farming systems approach to soil and water quality planning. Conservation compliance programs are probably the most wide spread type of on-farm conservation planning that exists at the present time.

Question 8. What role, if any, do you see for existing conservation compliance plans in an expanded "integrated farming systems" approach?

Answer. Conservation plans and conservation compliance plans have provided the basis for promoting and encouraging an integrated farming systems approach to addressing natural resource issues. They have paved the way for further use of the planning process to help achieve sustainability of our national resources through a systems approach to planning. Although conservation compliance plans have been completed on 95 percent of our highly erodible agricultural lands, about one-sixth of our Nation's farm lands still do not have the advantage of the first stages of a conservation plan. We must continue to build on the bases of the plans we do have, while expanding our ability and efforts to obtain compliance and bring additional lands into the planning process on every watershed and farm that has the need. It is through the individual plans that we will be able to carry out programs that address issues based on a region, watershed or ecosystem.

Reference: The report mentioned a number of aspects of the soil and water quality problem that still require research.

Question 9. How would you prioritize the research needed to implement a comprehensive program to promote soil and water quality? How do you propose to get the research arm of the Department to focus on these priorities? What is the mechanism for cooperation between SCS and ARS on these and other research priorities?

Answer. A prioritized research agenda should reflect the "full life cycle" of research needs which includes basic, applied and adaptive research. USDA uses a bottoms-up process to identify important areas or research which contribute to

achieving the Department's vision and mission. SCS and ARS have entered into a Memorandum of Understanding to improve cooperation on soil and water related research including development of models, databases, decision support and information systems. This partnering agreement serves as a model for cooperation among other research groups both within and outside the Department of Agriculture. SCS and EPA have also developed a memorandum to cooperate on issues and activities of mutual benefit which includes work on environmental indicators and methods of monitoring.

Most of the agenda indicates the need for applied and adaptive research to support the use of soil and water quality as measures of environmental condition. Very little basic research is required, however, a large amount of applied and adaptive research is vital to success. Joint work of USDA–ARS, CSRS, ES, FS, SCS and EPA–EMAP can be expanded, and in some cases refocused, toward the following research items dealing with soil quality:

Applied Research

- a measure index of soil quality
- soil quality indicators relevant to an index
- relationships between indicators and landscape scale processes
- linkages of soil quality to environmental functions
- monitoring strategy to determine regional and national levels of soil quality (NRI)
- assessing farming systems throughout the United States in relation to soil quality
- evaluating resource management practices in terms of soil and water quality criteria

Adaptive Research (mostly among USDA agencies)

- designing cropping systems that enhance soil and water quality
- involving land users in designing and evaluating appropriate measures to maintain environmental sustainability.
- utilizing communication techniques that promote acceptance adoption of appropriate land technologies

Reference: In this time of deficit reduction and budget cuts, it is becoming increasingly difficult to find new money to fund Federal programs. Individual farmers are concerned that they may be held responsible for meeting environmental standards even if the funding to assist them is not available.

Question 10. Do you think that individual farmers should have to pay for improvements they make on their farms to comply with environmental standards?

Answer. Farmers and the public have traditionally shared the cost of environmental improvements and this cost sharing is a reasonable approach to paying for environmental improvements. This is because some of the benefits from these improvements accrue to the individual farmer in the form of increased productivity and some accrue to the public in the form of improved resource conditions such as improved water quality. It is important to target these funds and to cost share only where it costs the farmer money. Adopting practices that result in immediate cost efficiencies to the farmer would not have to be cost shared.

Reference: The report indicated that a major problem is not a lack of technology, but the fact that more farmers aren't using the technology, and that traditional technology transfer mechanisms are inadequate.

Question 11. What needs to be done to improve the transfer of these technologies to farmers? Do you think that the Sustainable Agriculture Research and Education program could serve as an effective model for technology transfer?

Answer. Yes. The irony is that we have never known more about how resources interrelate and how resources work, yet our conventional mechanisms to transfer that technology are not as strong as they once were. Many traditional governmental entities at Federal, State, and local levels are downsizing. At the same time there are many competing voices in the private sector that are focused on single resource issues.

Question 12. What can be done to strengthen sustainable technology transfer?

Answer. One model that has found success for many years is that of State-Federal partnership in resource conservation. In this model the focus on technological access would be through a local conservation or natural resource district. This model remains a viable mode of technology transfer, albeit in potentially new

ways. Also, State programs such as Iowa's Integrated Farm Management and Model Farm Programs have demonstrated success.

Another model that has been successful in certain applications is that of alliances. Alliances for promoting sound cropping systems (crop residue use) have proven that new partnerships can bridge gaps that have been left in the support structure when traditional agencies are not able to carry the entire burden.

The previously mentioned Sustainable Agriculture Research and Education Program (SARE) is yet another model that has been successful in transferring technology at the farm-level. SARE has given farmer research and development encouragement and a voice for extension of its products. In partnership with existing foundations and farmer-led sustainable agriculture networks, SARE has developed a new network that supplements alliances and other institutional arrangements. SARE has also effectively tapped the potential of electronic media for rapid data and information exchange.

There is room for all three models. A partnership of everyone involved in using ecosystem principles to promote sustainable agriculture will likely be the only way progress will be possible.

Reference: The report mentioned input taxes on nutrients and pesticides as a way to create additional revenue to fund programs to improve soil and water quality.

Question 13. What is the administration's position on imposing input taxes on farmers?

Answer. The administration has not developed a position on input taxes to create revenue to find programs for soil and water quality improvement. Such a position may be developed for the 1995 Farm Bill.

We would point out that there is a trend for more of the financial support for conservation to be generated at the State level. Input taxes at this levels can be effective in targeting specific conservation problems, and if assessed, should be used for research, education and demonstration. The Iowa ground water protection act is an example of this concept.

Reference: The report emphasized the importance of record-keeping for the "integrated systems approach" to soil and water quality.

Question 14. Should farmer record-keeping be a requirement for compliance?

Answer. For many farmers record keeping is not a new idea, particularly for inputs such as restricted use pesticides and sewage sludge. We have not developed a position on record keeping for compliance. However, we know that we currently spend 30–50 percent of field office staff time in keeping track of and updating compliance plans in areas with large amounts of highly erodible cropland. The Agency, in keeping such records for farmers, has sacrificed that much time which would have been better spent assisting producers, implement conservation systems. In our efforts to improve efficiencies, farmer responsibility for maintaining conservation records makes sense.

> *'NEWS FROM SCS PARTNERS*—EPA will hold a conference on "The New U.S. EPA Enforcement and Compliance Structure" at the Doubletree Hotel in Arlington, Virginia, April 26–27, 1994. This conference will cover the most important aspects of the new EPA Office of Enforcement and Compliance Assurance and the impact of the office on business, industry, and environmental protection. For more information, call Inside Washington Publishers (inside EPA) at 1–800–424–9068 or (703) 416–8505.'

POSITION STATEMENT OF THE AMERICAN FARM BUREAU FEDERATION

The new report "Soil and Water Quality—An Agenda for Agriculture" by the Committee on Long–Range Soil and Water Conservation, Board on Agriculture, National Research Council presents a wide range of ideas. Some are useful ideas that have been supported by the farmer and rancher members of Farm Bureau for a long time. Other ideas contained in the report seem to threaten the very economic strength of agriculture and the United States as a whole.

Unfortunately, the report contains a number of miscues and incorrect information. For instance, on page 408 the report says, ". . . a 50-cow herd will produce about 545 metric tons (500 tons) of manure daily." First, the conversion from metric tons to U.S. tons is wrong. It should be 545 x 1.1023 = 601 tons. That means each cow would produce 12 tons of manure daily (601/50 = 12) or more than 17 times its own body weight in manure daily. In proportion, an average 150 pound human would have to produce over 2,576 pounds of waste per day. This is a serious mistake

because it exaggerates the amount of manure produced by a dairy cow by 19,132 percent. It is serious because it has been printed by the prestigious National Research Council. If errors like this are used to promulgate regulations it could do great damage to the agricultural industry. Moreover, misstatements like this raise serious questions about the validity of the rest of the report.

• **BASIC CONCEPTS**: The three basic concepts, as listed in order of their importance in the report are, first, environmental importance of soil; second, pollution prevention; and profitable and productive farming systems.

Farmers know that an environmentally sound agriculture is only achievable and sustainable over the long haul if it is profitable. Therefore, voting delegates representing Farm Bureau's active farmer members list profitability first and environmental protection a dependent second.

The attitude of the report's authors can be summed up in the following quote, "In some watersheds, refinements that impose real cost on producers may be required . . . ". The authors rarely consider the economic impact on either producers or consumers. In other words, a farmer's financial situation is inconsequential. Apparently, the report's authors consider it quite acceptable for regulators to make farmers spend as much as it takes to fix it the way the regulators want it.

• **Soil Quality.** *The report recommends that protecting soil quality should be a fundamental goal of national environmental policy.*

Farm Bureau has long recognized the importance of maintaining a productive soil resource. However, farmers have seen the negative impacts and effects that misguided national environmental policy has on the economy and private property rights, often without real improvements in environmental quality.

The report states " . . . current estimates of damage from erosion understate the true extent of soil degradation." Actually, current erosion estimates overstate erosion in many cases because neither the Universal Soil Loss Equation nor the Wind Erosion Equation account for soil deposition. Not all the eroded soil leaves the farm, nor does it all get into streams and lakes.

• **Pollution Prevention.** *Preventing surface water and ground water pollution by reducing the sources of contamination by nutrients, pesticides, sediments, salts and trace elements should be the goal of national policies.*

We are pleased to see that the report recognizes that the Clean Water Act's " . . . national goal that the discharge of pollutants into the navigable waters be eliminated by 1985" is impractical and unattainable in the context of nonpoint source pollution from agriculture.

Farm Bureau believes pollution prevention can best be accomplished by voluntary and incentive-based programs. Farm Bureau policy supports using scientific assessment, cost-sharing, properly funded educational and research programs, directing emphasis at the most critical erosion problems, tax credits, low interest loans, grants and preferential tax treatment and commitment of a greater portion of government expenditures to on-farm conservation efforts.

The latter point is critical. Under the Clean Water Act the Federal Government has poured tens of billions of dollars into reductions of pollutants from point sources. Less than one percent of that amount has been authorized for agricultural nonpoint sources and not all of that has been appropriated. Most of what has been appropriated has been spent by State and local government. Only a very little has gone to assist farmers or ranchers in implementing practices on the ground. Farmers cannot automatically raise the price of their products to reflect all the water quality improvement costs demanded of them. It seems fair that the public should help pay for what it perceives as action beneficial to society in general.

• **Profitability and Productivity.** *National policies should take advantage of opportunities to protect soil and water quality while sustaining profitable production of food and fiber.*

Farm Bureau believes the number one goal of any proposed farming method should be to allow the farm operator to make a profit if he or she is an effective and efficient operator. The key to getting farmers to adopt new practices that improve soil and water quality is their profitability. If the practice increases the profit per unit of output then farmers will adopt and adapt it quite rapidly. No-till methods of crop production, which are a subset of the large umbrella term conservation tillage, is a good example. No-till soybean acreage quadrupled from 1989 to 199 not just because it reduces soil erosion, which it does quite well, but because it was more profitable. Two other obstacles to no-till soybean production were also overcome in the 1980's, too. Better no-till drills were developed, and crop protection tools that enabled farmers to control weeds without cultivation became available, but, had not the profitability factor increased, it is doubtful farmers would have adopted

it as enthusiastically, even with the advent of conservation compliance, on highly erodible land.

The other point made in the report that we would like to emphasize is that there are diverse technologies and management methods that offer promise of improving soil and water quality and maintaining or enhancing profits. Farm Bureau believes *solutions must be site specific.* One-size-fits-all, command and control solutions will not work, and certainly will not be cost effective.

• **Enhancing Soil Quality.** *National policy should seek to conserve and enhance soil quality as a fundamental first step to environmental improvement.*

The report at least talks about conserving and enhancing soil quality, indirectly recognizing that it cannot be "preserved" as many seem to think it can. Soil is always changing. The report also finally recognized soil compaction from farm equipment is a major force that accelerates erosion and runoff, and reduces the soil's air and water holding capacity, all of which results in reduced potential for plant growth.

Soil compaction has been overlooked, under-researched and dismissed as a non-problem. We are pleased to see this issue recognized in such a prominent fashion. Farm Bureau recognized the problems of soil compaction from heavy farm machinery in the early 1980's. In 1984, the American Farm Bureau Federation published a 54-page workbook, slide/tape show and a leader's guide for a 1/2-day workshop that focused on soil compaction and erosion control. Reducing soil compaction will go a long ways to reducing runoff and erosion, increasing water and nutrient input use efficiencies and maintaining healthy crops.

Enhancing soil quality is another issue that has been overlooked for too long. More often than not, the emphasis has been on soil conservation and erosion control techniques. Conservation, by definition, is a Band–Aid approach that slows, but does not stop erosion. Building up soil quality, particularly organic matter content, can be done with biosolids, manure, compost, and certain cover crops. One possible option to enhance soil quality may be to fine tune the Conservation Reserve to offer contract extensions that allow enhancing soil quality via application of manure, compost and biosolids.

Also, it would still be beneficial if thinking and attitudes within the entire agricultural research and production industry could be redirected from soil conservation to soil quality enhancement.

• **Efficient Use of Inputs.** *National policy should seek to increase nutrient, pesticide, and irrigation use efficiencies in farming systems.*

Farmers are always looking to increase efficiencies of input use. Farm Bureau supports research aimed at reducing overall inputs needed to sustain a profitable farming operation and efforts to provide information to farmers on proven methods of improving efficiency of inputs.

However, we oppose any attempt to mandate low input methods of farming and requiring low input methods as a condition of participation in government farm programs. Farmers have found over time that low inputs often mean low outputs and low income. Mandating practices that have the effect of lowering outputs and profits will not be tolerated.

"The harder you push

for yields,

the better it is for

the soil."

Herman Warsaw, 1983

Herman Warsaw farmed for many years in central Illinois. He was a leader in chisel plow conservation tillage. Between 1964 and 1978 he doubled the organic matter content of the top three inches of his soil from 3.3% to 6.6%. Soil with organic matter content of 5 to 6 percent is considered desirable and would be similar to the 5.8% organic matter content found in nearby undisturbed fence rows. In the ten years leading up to 1983, Warsaw raised dryland corn crops of over 300 bushels per acre four times on the same field. This was nearly three times the national average yield of about 110 bushels per acre.

While the report recognizes a need to sustain profitable operations, we are concerned that it is almost always mentioned as an afterthought to environmental concerns. We are concerned that this tone might be carried over into legislation and regulations that are in proposed as a result of the report.

• **Resisting Erosion and Runoff.** *National policy should seek to increase the resistance of farming systems to erosion and runoff.*

Intuitively, farmers desire to increase the resistance of their soil to erosion caused by runoff. Farmers also know that the amount of rainfall that is stored by the soil is one of the biggest factors affecting yield. It is to their long-term benefit to improve the depth and water-holding capacity of the soil.

However, the direction is clear. The report emphasizes national policy and using computers to design farming systems that resist damage from storm events of various duration and intensity. While some computer simulation is useful, it is generally bureaucratic intensive and rarely does anything other than produce more paperwork.

Farmers worry about what kinds of farming systems **national policy** will prescribe. National prescriptions typically limit the flexibility of farmers to respond to weather, insects, disease, and international markets. Controlling erosion is often very site and soil specific.

Moreover, increasing resistance to runoff may cause more of it to infiltrate, which would be self-defeating to the drainage systems farmers have installed to improve the productive capacity of their land. Increasing infiltration may also suddenly put them back intoconflict with wetlands regulations.

There are significant tradeoffs here that need to be recognized and dealt with before proposing any national policies.

• **Field and Landscape Buffer Zones.** *National policy should seek to make greater use of field and landscape buffer zones.*

The report states that "Field by field efforts . . . will not be adequate to protect soil and water quality in regions where overland and subsurface movement . . . are pervasive." Therefore, the report rationalizes that buffer zones need to be created and existing ones protected. The report says Federal, State and local government should promote policies to protect existing riparian vegetation. It further says that creation of landscape buffer zones should augment, not substitute for, improved farming systems.

Farm Bureau recognizes there is a technically sound base for riparian buffer zones. They can keep a tremendous amount of soil and nutrients out of streams and

lakes. However, we foresee these greenbelts increasing conflicts over private property rights, reducing farm income, reducing food supplies, reducing potential for trade and increasing the U.S. dependency on foreign countries for food.

The unfortunate part is that too many people will seize on the right reason and use it zealously to do the wrong thing.

One only has to look at the diagram on page 428 of the report to begin to visualize the impact on agriculture. Once any perennial or intermittent stream is lined on both sides with the report's recommended riparian buffer zones, many agricultural operations will be ensnared in a weblike entanglement that will further erode private property rights.

We are concerned these buffers will create farther headaches for farmers as those who know little about agriculture demand more regulations on adjacent farm activities to protect the new streamside buffer zones. Some will try to use the greenbelts to eliminate agriculture, forestry, and most other human activity from the area.

Farmers are particularly wary of buffer zones attracting endangered species and all the subsequent problems that come with the current Endangered Species Act. *The Endangered Species Act could be a win-win situation if it was modified to encourage and compensate landowners for producing habitat conducive to endangered species or for propagating them.* Farm Bureau supports a voluntary Critical Habitat Preserve Program where landowners could enter into 5 year contracts with the Department of the Interior. The Secretary would provide technical assistance and an annual payment, determined on a bid basis, to owners and/or operators for protection and management of habitat.

We are concerned that the recently created National Biological Survey and its staff will abuse private property rights via unauthorized access and use of these riparian buffer zones.

Also, while having positive impacts on water quality and wildlife, current conservation standards would translate riparian buffers into reduced food and fiber supplies. Recommended widths of forested buffer zones range from 50 to 150 feet (University of Maryland Cooperative Extension Service and The Connecticut Council of Soil and Water Conservation). USDA ASCS specifies one to 1–U2 chains (66.5 to 100 feet) width for both grassed and tree filter strips in the Conservation Reserve Program (CP 13). When placed on both sides of a stream a 100-foot buffer takes 24 acres of farmland out of production for every mile of stream. For instance, on Iowa's 82,254 miles of perennial and intermittent streams and ditches, that could reduce land available for farming and forestry by 2.0 million acres.

On a half-section of land, that amounts to nearly 8 percent of the tillable acres. Reducing a farmer's income potential by 8 percent simply forces farms to become bigger and fewer.

The 100-foot distance appears to be based more on whim than on science. The dripline of some mature trees averages about 50 to 60 feet in diameter. Someone apparently decided that it would be nice to have at least two mature trees beside every stream, therefore an undisturbed buffer zone of 100 feet was deemed necessary.

However, scientists at the University of Iowa found relatively narrow strips of three or four rows of hybrid poplars less than 30 feet wide on each side of the stream reduced sediment and nitrogen moving into intermittent streams by 81 percent and 56 percent respectively. These trees can be harvested for biomass energy and regrow without being replanted. From a farmer's standpoint, that means much less land taken out of crop production; and the buffer zone itself, represents income potential, possibly on an annual basis, if one row can be harvested annually on an alternating basis.

• **Problem Areas.** *The Secretary of the USDA, the Administrator of EPA and the U.S. Congress should undertake a coordinated effort to identify regions or watersheds that should be highest priority for Federal, State, and local programs to improve soil and water quality.*

Farm Bureau supports having one clear set of priorities for Federal agencies instead each one doing a separate and possibly conflicting activity or program and we favor directing emphasis at the most critical erosion problems.

Farm Bureau policy specifically states:

> "The pursuit of pollution abatement should be only one of many factors considered in the development of national water policies. Other factors, including the cost of pollution abatement, the needs of agriculture, the needs for growth, and the presence of naturally occurring pollutants, must also be considered.

We urge that sponsors of watershed projects be diligent in promoting full understanding, within the project area, of all physical, technical and financial aspects of the proposed project.

We are opposed to Federal regulation or control of runoff water into non-navigable streams."

• **Problem Farms and Farming Systems.** *Soil and water quality programs should be targeted at problem farms that, because of their location, production practices, or management, have greater potential to cause soil degradation or water pollution.*

The report recommends as a goal that "problem farms" should be looked at.

Farm Bureau has several concerns about this:

(1) Who defines "problem" farms?

(2) What does it mean?

• **Farming Systems.** *The development and implementation of approved farming system plans should be the basis for delivery of education and technical assistance, should be the condition under which producers become eligible for financial assistance, and should be the basis for determining whether producers are complying with soil and water quality programs.*

The report states "The farming system concept was central to the development of the report . . . ." The 1990 Farm Bill and the 1990 Coastal Zone Act Reauthorization Amendments are cited as "new authorities that can be used to implement many of the committees' recommendations."

It further states . . . an integrated farming plan should be required of producers, regardless of their participation in farm programs, in regions where soil degradation and water pollution caused by farming practices are severe."

Farm Bureau has several concerns about this: (1) Who defines "severe" (2) What does it mean? (3) Is an EPA 305b water quality report based on an observation from an Izaak Walton League volunteer who finds farmland within sight of his/her stream enough to classify agriculture as a severe problem?

Farm Bureau is opposed to linking farm program benefits with well testing and ground water contaminations concerns.

• **Better Management Tools.** *Developing and implementing cost-effective diagnostic and monitoring methods to refine the management of soils, nutrients, pesticides, and irrigation water should be high priority of USDA and EPA research and technology transfer programs.*

Farm Bureau supports the call for USDA & EPA to develop cost-effective diagnostic and monitoring methods to refine management of soils, nutrients, pesticides and irrigation water.

Where the system falls down is in the technology transfer. Part of the mission of USDA's Extension programs is to help transfer technology. So much of Extension's efforts have been moved out of production agriculture that they have become almost a non-player. In this age of budget crunches, we propose an innovative solution to technology transfer. We suggest that the Federal Government develop an incentive-based pay system for employees who want to participate in the transfer of technology. Those whose performance can be clearly documented as having improved the environment and increased the profitability of those who used the technology would be rewarded. This would bring the marketplace into play and provide significant incentive to both the farmer and the technology transfer experts.

• **Better Information.** *Keeping and using records of production practices, crop and livestock yields, and other elements of the farm management system should be a fundamental component of programs to improve the management of farming systems.*

The report further recommends mandatory record-keeping for anyone who receives government financial assistance and for ensuring compliance.

Purely from a farmer's self-interest in an efficient operation, record-keeping and cost-effective diagnostic tools should be a normal part of every farmer's operation. The report, however, couches these tools in the framework of public policy mandates. Farm Bureau policy encourages farmers and ranchers to voluntarily keep records of all pesticide uses, but supports mandatory record-keeping only for restricted use products if the records are kept confidential and are treated as confidential business information.

• **New Cropping Systems.** *Research and development of economically viable cropping systems that incorporate cover crops multiple crops, and other innovations should be accelerated to meet long-term soil and water quality goals.*

Farm Bureau fully supports this type of research as long as emphasis remains on **economic viability** and voluntary adoption.

• **Criteria and Standards.** *USDA and EPA should initiate an integrated research effort to develop quantible standards that can be used to evaluate the management of farming systems.*

The report recommends USDA and EPA convene an interagency task force to develop standards that can be used to implement and evaluate integrated farming system plans. The report states, "There is an urgent need to develop the scientific capacity to provide producers, policymakers, and program managers with more rigorous methods to determine how much improvement in the management of farming systems is needed to meet specific soil and water quality goals."

Farm Bureau has extensive policy supporting development of better methods for scientific assessment of water quality and recommends that the Beaver Creek Hydrologic Unit Area project, near Memphis, Tennessee be used as the model to develop monitoring and assessment methodologies for other projects.

Farm Bureau recommends that no major public policy changes regarding the regulation of nonpoint source pollution from agriculture and forestry be enacted until final results from the Beaver Creek HUA are published.

Farm Bureau also has developed a notebook of materials encouraging the 36 State and associated county Farm Bureaus to become involved in the 20 new National Water-Quality Assessment (NAWQA) projects started up by the U.S. Geological Survey in October, 1993. Specifically, they are being asked to work with USGS to develop smaller Beaver Creek type projects (watersheds of 50,000 to 100,000 acres) within the larger regional NAWQA watersheds.

The concept of developing reference soils as a standard to determine soil quality appears to be of questionable value. Soils are always evolving. What would have been reference soil 10,000 years ago in the upper Midwest is certainly not the same soil today. If reference soils are used to set rigorous standards, it will likely limit farmers from trying to enhance soil quality beyond those limits. Soil types can vary tremendously within a given field.

The report's recommendations on minimum tests for indicators of soil quality appear too research oriented and ultimately too expensive. Even the researchers working with the Rodale Institute have expressed concern about the complexity of measuring soil quality and the resultant time and expense involved. From a practical standpoint, simple in-field tests are the key. Infiltration rates, pH, organic matter content, residue cover and relative compaction are measurements that can be made in the field. They require simple equipment, minimal expense and provide quite a bit of insight into soil and water quality. Ideally, equipment should be developed that would allow as many of these tests to be conducted on-the-go with results computerized and documented instantaneously.

• **Barriers Imposed by Price and Supply Control.** *Federal agricultural price support and supply control programs should be reformed to increase the flexibility participants have to diversify their cropping systems.*

Protection of base acres may have led to more monoculture of corn. However, in many instances, monoculture corn may be equal to and perhaps even better for, soil quality than a corn/soybean rotation.

Moreover, reducing farm program payments may reduce the profitability of landowners to the point that they can no longer afford to pay for the installation of needed conservation measures such as terraces and waterways.

Further, it is a heroic assumption to assume that crop rotations will automatically include soil-building hay and pasture. This implies that the producer will have livestock or easy access to hay markets. There are numerous obstacles to raising livestock. Fewer and fewer producers want to be responsible 24-hours a day, 7 days a week for their care. Hired help is even less so inclined. Paying for health. Care, insurance, FICA and social security for hired labor are also major deterrents. Much of the infrastructure for livestock production is no longer present. Building and maintaining fence is still time-consuming . . . and a major headache. Streamside buffer zones recommended elsewhere in the report put a major dent in the ability of a farmer to water pastured livestock. In addition, increasingly stringent point-source regulation of livestock components, of farming operations, is a very real legal and financial disincentive to many farmers considering diversification. Finally, many farmers have concluded that legal, nuisance and expense problems with odor and manure disposal are more hassle than it's worth.

• **Soil and Water Quality as Policy Objectives.** *Long-term protection of soil and water quality should be based on policies and programs that are independent of price support, supply control, or income support mechanisms; policies are needed that target problem areas and problem farms, regardless of participation in Federal commodity support programs.*

Farm Bureau policy recommends that appropriated funds be used to correct water pollution problems on a "worst case first" basis.

Long-term protection can best be accomplished by a long-term Federal commitment to an appropriate conservation credit program that recognizes and rewards good conservation that improves soil and water quality. The commitment should be a minimum of 30 years, with a 100 year commitment being preferable. This is a reasonable expectation since the Federal Government is looking to extract environmental easements from farmers of 30 years to perpetuity.

• **Research Applications.** *Two types of research should be high priorities for USDA and EPA research programs: (1)research directed at identifying the nature and magnitude of factors influencing producers' management of cropping and livestock production systems and (2)research leading to the development and implementation of new technologies, cropping systems, and methods to manage farming systems that are profitable and protect soil and water quality.*

Farm Bureau supports research aimed at reducing overall inputs needed to sustain a profitable farming operation, and efforts to provide information to farmers on proven methods of improving efficiency of inputs. Keep in mind that farmers believe a clean environment is dependent on keeping the farm operator profitable.

As far as research for identifying factors influencing management decisions, we have some concern about spending money for research that continues to look at demographic factors such as age, education, income and the traditional factors that have been looked at in the past. It has been demonstrated over and over again that they provide few good average insights on how to change an individual's behavior. The research that is necessary will need to center on training for technology transfer specialists. It must help them learn how to deal one-on-one with the farmer and equip them with the skills to be able to identify what it is that really motivates that individual to change and more importantly who is the key influencer of the decisions that farmer makes. In other words, is that farmer a risk taker, a show-me person, or a hands-on, does-it-work-on-my-farm, person, and who influences that person the most—is it the spouse, the banker, the local ag chemical dealer, university researcher, parents or the local clergy. Answers to these questions must be obtained before any changes can be attempted.

• **Technical Assistance.** *Aggressive public sector programs, based on modern marketing methods, are needed.*

Mechanisms should be developed to augment public sector efforts to deliver technical assistance with nonpublic sector channels and to certify the quality of technical assistance provided through these channels.

Research should be directed at the design of market-based incentives to protect soil and water quality.

On the policy side, the report recommends designing "market based incentives to protect soil and water quality." It goes on to describe these incentives as " . . . tradable pollution permits, taxes and fee . . . ". Incentive—they are not—they're regulatory disincentives and penalties.

Farm Bureau strongly supports tax credits, low interest loans and preferential tax treatment and market-based incentives to aid and encourage farmers to implement sound management practices.

The report further expects tradable pollution permits to reduce the cost and increase efficiency of protecting soil and water resources. The report fails to recognize that tradeable permits will require accurate scientific knowledge of what's happening on the landscape.

Farm Bureau policy has the following to say about pollution permit trading:

> "We believe that pollution permit trading should be included in the reauthorization of the Clean Water Act as one approach to implementation of the act's requirements. We believe the Clean Water Act should outline the general guidelines of pollution permit trading but allow local entities to de-

termine the management system which best fits it needs. These general guidelines should:

(1) Have a goal of water quality improvement;
(2) Set environmental goals and constraints which cannot be changed arbitrarily by any member of the system;
(3) Identify and establish a credible monitoring system which:
   (a) maintains a set of baseline data obtained on a case-by-case basis;
   (b) manages transactions; and
   (c) monitors environmental conditions and activities across permit traders; and
(4) Allow farmers who achieve reductions beyond the permit's requirements "bank" their reductions for future trading."

• **Long-Term Easements.** *A program to purchase selective use rights from producers through long-term easements should be developed to protect environmentally sensitive lands.*

Farmers and Farm Bureau generally are not in favor of "long-term" easements. Thirty-plus years is too long a planning time frame to be locked-in with no flexibility to meet changing markets or societal demands. Annual conservation credits and contracts in the 5- to 15-year range with producer options to renew are much more practical, flexible and acceptable to farmers.

• **Nonvoluntary Change.** *Nonvoluntary approaches may be needed in problem areas where soil and water quality degradation is severe and where there are problem farms unacceptably slow in implementing improved farming systems.*

What if farmers don't change fast enough to suit the tastes of the report's authors? The report recommends nonvoluntary approaches where problems are severe, and "where there are problem farms unacceptably slow in implementing improved management systems." The message is clear—do as they say, and do it now, or else.

Nonpoint source pollution is manageable. It is not a crisis. It takes steady, consistent national policy over a long time frame to make a difference.

Farm Bureau believes voluntary, incentive-based programs are a more cost-efficient way to proceed.

• **Rights and Responsibilities.** *The legal responsibilities of landowners and land users to manage land in ways that do not degrade soil and water quality should be clarified in State and Federal laws.*

What is meant by legal responsibilities?

We believe this recommendation is another frontal assault on private property rights. The only thing this would accomplish is to further alienate those who produce the food from those who consume it. It will also create untold expense for farmers defending themselves against unnecessary lawsuits.

SIGNIFICANT IDEAS/ISSUES SURFACED BY THE REPORT THAT HAVE BEEN PREVIOUSLY OVERLOOKED, UNDERFUNDED OR DISMISSED AS NONPROBLEMS

Importance of Landscape Position. The importance of landscape position in terms of soil and water quality has been overlooked and not well understood. We've known for a long time that the topsoil has been getting progressively thinner and lighter colored on the knobs of our hills. Only recently, however, has the technology become available to measure yields on-the-go so that farmers can accurately relate landscape position to profitability and to the efficiency of input use.

By comparison, water quality as it relates to landscape position is a relative unknown. It's worth looking into, as long as using depressional areas to manage water quality does not become so onerous that it's not worth a farmer's time to consider. Unfortunately, the Federal Government's regulations on wetlands and endangered species have made this all but impossible. The new FSA manual regulations that will use stunted crop growth to identify wetlands will further exacerbate and diminish the potential for farmers to be able to manage the landscape.

Targeting Problems and Resources. Targeting has been overlooked and underfunded. The Conservation Reserve Program and conservation compliance targeted highly erodible land. But, even that target has not been hit as effectively as it could have been. However, targeting problems with resources may not be the end-all for water quality and soil quality. If farmers intend to "enhance" soil and water quality, then nearly every square foot will have to be considered. It will take some combination of targeting and wide-spread distribution of resources to do the job.

Farming Systems Approach. Specialization, particularly at the research level, has been encouraged, even though farmers must, by their very nature, indirectly

consider everything as part of their system. Ceiling input suppliers, researchers and regulators to think in terms of the total system will have some benefits.

Vertical Integration. The overall structure of agriculture is a key policy issue. While the report briefly mentions it, the structure of agriculture is rapidly changing. Unless soil and water quality are addressed within this context, regulatory or legislative "solutions" to improve these resources will likely fail miserably.

Channel Erosion. While it has been researched to a limited extent, a concerted effort has not been made to address this rather large issue. We are pleased to see this issue discussed on page 198 and in chapter six. However, we are distressed that is not accorded due presence in the executive summary. Sediment is reported by EPA to be the single biggest nonpoint source of pollution in impaired waters of the United States. The report states that 25 to 60 percent of the sediment load in rivers in Iowa, Illinois and Mississippi is estimated to come from channel erosiory. Other sources have estimated that channel erosion contributes as much as 80 percent of the sediment in a river in Alabama. This clearly points up the problem that a great portion of the sediment problem is not the farmer's problem, but a naturally occurring process, unresponsive to government regulation or landowner established BMPs.

Issues Overlooked or Not Addressed Seriously by the Report:

Weed Seed Spread by Harvest Equipment. No mention is made of the impact harvest equipment has in spreading weed seed, representing a major reason to broadcast herbicides the following year. If harvest equipment could destroy or collect weed seed rather than broadcasting it out the back end, then there would be less need to spray for weeds the following year.

Weed Seed Grown in Buffer Zones and Spread by Wildlife. Once a riparian buffer zone is established there will undoubtedly be severe restrictions on weed control within the zone and adjacent areas. Wildlife carrying weed seed into the field will be one more pressure on the farmer.

Wildlife Damage to Crops. The riparian buffer zones will increase wildlife numbers and subsequent wildlife damage to farmers' crops. Farmers are generally supportive of wildlife, but a survey of Farm Bureau members found wildlife already causing a significant amount of damage to crops and livestock on many farms and ranches. The cost of this damage was often in the thousands of dollars.

Increased Fixed Cost and Reduction of Total Farmable Acres as a Result of Land Taken Out of Production for Buffer Zones. Farmers currently are still required to pay property tax and the mortgage on land even if it is in buffer zones ostensibly for the purpose of a public benefit. A 100-foot buffer on both sides of the stream as the Conservation Reserve Program can require would take out 24 tillable acres per mile of stream and reduce a farmer's income potential by at least 8 percent on a half-section of land.

Growing Global Population, Food Supply and Environmental Needs. To feed a growing world population it may be better to grow the food in the United States. Under sound conservation practices rather than destroying the environment of other countries to produce food.

Psychology of Motivation. Real incentives and rewards for doing a good job of conservation are not discussed. Farm Bureau believes a reward system will get far more accomplished, and make people feel good about it, than will the vinegar of taxes, fees, penalties and mandatory command and control proposed by the report.

Voluntary Efforts. The report mentions voluntary soil and water conservation efforts, but summarily dismisses them in favor of mandatory, regulated efforts set by national policy.

The least they could have done is put in a page on the successful 9-year conservation credit pilot program conducted in Pepin County, Wisconsin. Farmers **voluntarily** figured out how to farm their land to control erosion to levels below the tolerable soil erosion level (T-value) in exchange for a partial credit against their local property tax. Within two years after the program was initiated the number of farmers with conservation plans had doubled and the countywide average soil erosion had been cut in half, to less than the tolerable soil loss.

Allowing an annual conservation credit that farmers could apply towards local property taxes or their Federal income tax is an incentive Farm Bureau supports and many farmers would use. If available as a credit against property taxes, we believe it would also encourage many absentee landowners to apply good soil and water conservation practices to their land.

Property Tax Relief. In the discussion of incentives nothing is said about using property tax relief to encourage conservation. Property taxes are one of the biggest

concerns of landowners. As noted above, more than twice as much conservation can be accomplished by providing some property tax relief than by all other methods that have been tried to date. Psychologically, tax relief is a powerful incentive. People will do amazing things in return for tax relief. Good water quality is the desired public benefit. The public cost for clean water can be minimized by rewarding farmers with some form of annual credit for meeting local soil and water quality goals. If the credit could somehow be used for property tax relief it would be a powerful incentive.

The alternatives to a credit to landowners for voluntary conservation efforts are for the cities to filter the pollution out of the drinking water alter the fact, or for Government to regulate or ban farming practices to the point that they don't pollute. The former we already know is very expensive. The cost of the latter is virtually incalculable, which then makes it relatively easy to propose since no one knows what it costs. We predict it would take over 100 years before the cost of a conservation credit program would equal the amount the Federal Government has spent in the first 20 years of the Clean Water Act on point sources of pollution.

SUMMARY

Farm Bureau is concerned that the report attempts to use the National Research Council to further the cause for mandatory restrictions on agriculture and further diminish private property rights. It does this by justifying the greenlining of America via the recommendation of riparian vegetative buffer zones along all streams as one of the keys to improving water quality.

We are concerned that the environmental laws are themselves becoming a real disincentive to voluntary conservation efforts.

Also, we are concerned that the recommended parameters for measuring soil quality are too research-oriented and too expensive. They may also limit flexibility in enhancing soil quality and limit farmers' ability to produce higher yields by using larger amounts of inputs more efficiently.

Farm Bureau supports voluntary, incentive-based programs that enhance farmers' profitability as the best way to improve soil and water quality. We also support sound, scientific assessment of the problem as the first step of targeting the resources of any policy or program.

POSITION STATEMENT OF THE NATIONAL WILDLIFE FEDERATION

Mr. Chairman, the National Wildlife Federation appreciates the opportunity to present written testimony on the National Research Council's report entitled *Soil and Water Quality—An Agenda for Agriculture*. The National Wildlife Federation is the Nation's largest citizen conservation organization working to educate, inspire, and assist individuals and organizations of diverse cultures to conserve wildlife and other natural resources. This statement will cover three areas: general comments, policy recommendations, pending and future legislation.

GENERAL COMMENTS

This report comes when the debate over our Nation's policy to protect soil and water quality has escalated. Reauthorization of the Clean Water Act, the reorganization of the U.S. Department of Agriculture and the 1995 Farm Bill are but a few examples of attention that will be given to soil and water quality in our Nation. And, it comes none too soon. The degradation of our Nation's soil and water quality continues to be a major problem. The solution will be difficult and complex.

The National Academy of Sciences, through the National Research Council, has done an excellent job of framing the issues surrounding soil and water quality. It is an accurate and critical piece of work. The report has reviewed many studies and organized the material to be the basis for further discussion and policy.

It is unfortunate the report did not go further in presenting policy recommendations. There is scientific and technical information on preventing soil and water losses. However, programs aimed at changing farming practices to limit the degradation of our Nation's natural resources are seriously lacking.

The report should be improved by addressing the value and benefits of wetlands to enhancing soil and water quality. While whole chapters are dedicated to issues such as nitrogen, phosphorus, and manure, only minimal mention or consideration is given wetlands.

POLICY RECOMMENDATIONS

Our remarks are limited to two areas addressed in the chapter on "Policies to Protect"—long-term easements and need for non-voluntary approaches.

The National Wildlife Federation is concerned that current programs such as CRP and Wetlands Reserve are temporary and underfunded. CRP, for example, works while the acres are retired, but these gains in soil and water quality will be lost if the program is terminated or lost. The taxpayer has paid billions of dollars to producers for the length of the CRP contracts and has nothing to show for it if the program is terminated. The Wetlands Reserve program is far underfunded to make a significant difference in wetland preservation.

The report accurately addresses the issue of easements. Special focus should be given to addressing landowner resistance to convey partial interest in their lands to the public for improving soil and water conservation. Protection of wetlands via easements in perpetuity is a policy which must be implemented.

Voluntary programs to protect soil and water quality do not have a good record of achieving the public's demand for meeting those goals. The present conservation compliance program using eligibility for commodity benefits as the incentive to improve wetlands and soil protection has not worked effectively. Producers have spent millions of dollars to find loopholes in commodity programs to gain approval of practices such as draining wetlands, rather than practices which improve and restore wetlands.

The report supports the idea that strong regulation is the best policy to pursue. The regulatory approach offers the promise of permanence. If landowners or operators must meet soil and water quality standards, these standards will apply in all circumstances, regardless of changes in market prices, ownership of the land, production systems, the structure of the farm enterprise, or the goals of the producer.

The report argues for changing the responsibilities and rights for landowners. Soil quality is a common good, the use and utility of which is subject to legitimate public policy concerns as is the basis for most water quality standards. The report stated:

> The responsibilities as well as right of landowners would be in the practical and psychological shift in the orientation of Federal soil and water quality efforts. In codifying a landowner's duty for protecting soil and water quality, the burden of primary responsibility would shift from the Government to the individual landowner. Rather than use programs which are based on inventing ways to educate, encourage, or coerce producers into protecting soil and water quality, the reorientation would establish that landowners and operators have a duty to protect soil and water from degradation. Rather than being the Government's responsibility to induce landowners to improve farming systems, it would be the duty of landowners to protect soil and water quality.

LEGISLATIVE RECOMMENDATIONS

The long-term legislative recommendations which need to be addressed from this report relate to the 1995 Farm Bill. Debate surrounding this should include efforts to implement the policy considerations identified by the National Research Council.

We recommend that preservation and restoration efforts be made permanent, rather than temporary such as the current Farm Bill. The American taxpayer has put billions of dollars into CRP and other conservation programs, and will have to do it again if the program is lost. This time these resources should have a much bigger element of permanence. One can only dream at the impact of spending the CRP funds in a permanent program would have been. If it was completed in 1995, the taxpayer would not have to do it again and would have something to show for itself after the contracts expire.

The biggest issue to be faced by the 1995 Farm Bill will be how to pay for conservation programs. The report and the National Wildlife Federation agree that special consideration should be given to revenue sources such as taxes on agriculture chemicals, fuel, heavy tractors, moldboard plows, irrigation water, drainage permits and other inputs. These can be related to soil, water and wetland quality degradation from agriculture production practices. Transfers from Commodity Credit Corporation programs to programs aimed at improving soil, water and wetland quality and quantity are another way to finance conservation programs.

The National Research Council's recommendations could be adopted in the short term via the reorganization of the U.S. Department of Agriculture. The administration's proposal needs to elevate soil and water conservation and avoid placing the current Soil Conservation Service in with the ASCS. The cost share programs should be administered by SCS, not ASCS. Finally, the appeals process should be opened to permit interested parties like conservation groups to participate.

Mr. Chairman, there is much more that could be said concerning this report. We expect to continue the dialogue the National Research Council has begun. You have

added to the debate by holding this hearing and we will continue to participate in this discussion. Thank you.

POSITION STATEMENT OF THE RODALE INSTITUTE

Mr. Chairman, and Members of this subcommittee, I am John Haberern, president of the Rodale Institute, a nonprofit agricultural research, demonstration and education organization based in Emmaus, Pennsylvania. Our 333-acre farm/research facility in nearby Kutztown, Pennsylvania is recognized nationally and internationally for its lifelong work in developing and implementing ecologically sound farming systems. I appreciate your invitation to provide written testimony concerning the National Research Council's report entitled "*Soil and Water Quality—An Agenda for Agriculture.*"

This comprehensive report largely supports the ideas and philosophies put forth by the Rodale Institute over its almost 50-year history. I find it gratifying that members of the National Research Council today regard soil quality as an environmental issue equal in importance to air quality and water quality. I would like to thank the National Research Council members for their dedication in creating this document. This report demonstrates the great progress we've made over the years in ways in which we regard agriculture in the United States. Still, there is much work ahead of us.

The specific points I would like to address in this testimony today are:

1. Soil quality.
2. The urgent need for a soil quality index.
3. Adopting a farming systems approach: moving away from reductionist thinking in agriculture.
4. Get the information flowing.
5. Let's stop beating around the bush.
6. It all begins at the farm gate.

Soil Quality

"Soil resources are no less important to our environment than are air and water," states Dr. Sandra Batie, Chairperson of the committee, in her opening statement at the release of this report. "Furthermore, water quality, and to a lesser extent air quality, depends on the quality and management of soils. The threat to soils needs to receive the same kind of attention from national, State and local policy-makers." I could not agree more.

The need to protect and improve soil quality has been a driving force of the Rodale Institute since its inception as the Soil and Health Foundation in 1947. The consideration of air and water quality as issues separate from soil quality, as if soil were not an integral part of our environment, has been misguided. To continue to do so calls for disaster.

Soil is the basis for life. All else depends on the vitality and continued health of this dynamic substance. Yet, as is true of all elements in nature, soil does not act alone. The Research Council's report acknowledges the cleansing and purification interactions of soil, air and water, each dependent on the other, each contributing to the health and effectiveness of the other. Ironically, few people regard soil so highly.

The Clean Air Act and the Clean Water Act recognized the importance of protecting the air we breath and the water we drink. These Acts brought home the awful truth regarding the degraded status of our air and water. And it was support from the public which allowed the United States to make dramatic improvements in our air and water integrity. I would like to see similar steps taken to protect our soil, our earth. Until the public understands what we unanimously agree upon here, we will make little progress in protecting this valuable resource.

Soil Quality Index

Throughout the Council's report, reference was made to "knowing there were areas where considerable degradation has already occurred" and "areas where farming systems have improved the soil," but being unable to precisely pinpoint those areas. To me, talking about soil quality degradation or improvement, knowing it exists but not knowing where or to what extent, is a lot like driving in an automobile without a functioning gas gauge. You know that when you started the car there was gas in the tank. But now, miles down the road, you have no way of knowing how much farther you'll be able to go. The tank could be half full. Or you could be riding on empty.

Likewise, how can we intelligently discuss the magnitude of soil degradation without knowing where or what extent the destruction exists? How can we ameliorate problem soils when we do not know where to start? How can we begin to allocate funds for soil improvement—and to whom—when we do not know the true status of soils from State to State, county to county, farm to farm?

In the summer of 1991, Rodale drew together 25 scientists and researchers from the United States and several other nations to discuss the parameters of soil quality. A major topic of discussion was the need for a soil quality index. We agreed unanimously on the need to establish such an index—a report card—on the status of agricultural soils here and abroad. A great deal is known about the general relationship of specific soil attributes as indicators of soil quality. Erosion statistics aside, however, little quantifiable documentation exists to record the degradation or improvement of our soils. (Our continued misapplication of agrichemicals has, in some cases, masked the decline.) Conversely, in response to improved farm methodologies, some soils have actually shown improvement. Yet we cannot measure or accurately pinpoint those areas, either. We need to develop more quantitative methods to measure and record changes in soil quality over time so that we can adequately and accurately allocate soil-saving resources to truly troubled areas.

Thus we would like to see immediate attention focused on carrying out the report's recommendation that "The Secretary of the USDA and the Administrator of the EPA should initiate a coordinated research program to develop a minimum data set of soil quality indicators, standardized methods for their measurement, and standardized methods to quantify changes in soil quality."

Rodale Institute is already working on an index, developing a Soil Health Index Test Kit for farmers to test the quality of their soil. We have the support of USDA's Agricultural Research Service in this effort. I am delighted to see this recommendation in the report and urge that it be put into policy and funded as soon as possible.

Adopting a Farming Systems Approach

Emphasis should be placed on the recommendation that "The development and implementation of approved integrated farming system plans should be the basis for delivery of educational and technical assistance, should be the condition under which producers become eligible for cost-sharing dollars, and should be the basis for determining whether producers are complying with soil and water quality programs."

Agriculture is no place for reductionist thinking. Just as air and water quality are intrinsically related to soil quality, the whole fabric of the land, crops, and animals our farmers cultivate is intertwined. Farmers need to move away from the idea of growing a single crop or think only of one growing season. Such thinking encourages the exhaustion of thousands of acres each year, allows nutrients to soak through the soil into the aquifer below, and wastes precious natural resources. Wasted natural resources cause reductions in profitability to the farmer, as he or she needs to add more soil amendments or use more pesticides in attempt at the quick fix. It will eventually mean higher prices to the consumer. Worse, as the quality of farmland and farm life spiral downward, so too will the quality of life in the United States.

In this instance, current Federal agricultural price support and supply programs must share the blame. I wholeheartedly support the recommendation that these programs should "be reformed to increase the flexibility participants have to diversify their cropping systems," Farmers should not be punished for implementing proven alternative methodologies or for diversifying the crops they plant. Nor should they be rewarded for single crop planting that requires extensive watering in arid climates or continued heavy chemical dosing on lands to maintain base acreage levels.

The Executive Summary points out: "A range of technical opportunities to improve the management of farming systems exists. In many cases, better use of available technologies, better understanding, and information would result in immediate gains in preventing soil degradation and water pollution, (my emphasis) many producers have already made substantial improvements in their farming systems." Likewise, Dr. Batie says in her opening statement that much of the technology and management methodologies necessary to "recreate" our farms is already in existence.

In my own experience, through working with Rodale's farmer-cooperators, I can testify to you today that many American farmers have profitability turned their backs on Government subsidies toward successfully utilizing the farming systems approach. The knowledge and expertise we need is already being put to the test on farms across the United States. Which brings me to my next point.

Getting the Information Flowing

The Executive Summary also states: "In many cases . . . private sector sources of information have become more important direct sources of advice and recommendations than public sources. Soil and water quality programs need to take advantage of the capacity of the private and nonprofit sectors to deliver information and education to producers."

This has been the mainstay of Rodale's philosophy throughout our history. We have found many times over that farmers listen to farmers. Farmers are also willing to talk about what works as well as what does not. This willingness to share experiences is the basis for our farmer networks. But this information, this networking shouldn't be restricted to a lateral flow. My point is this—there is much that the universities and the Extension Service can learn from our farmers. Right now, Rodale Institute is working with "teams" comprised of USDA Extension Service personnel and farmers, keeping the information gates open. Learning flows freely both ways. Our goal is not only to have extension be more in tune with farmers' real concerns and problems, but to build knowledge in both directions. Through this program, American farmers are also the teachers, sharing with extension personnel what they have learned and experienced in real farm situations.

It is my opinion that soil and water programs, to be successful, need to take advantage of programs like those mentioned above. Information must flow both ways. Just as we need to move away from reductionist thinking in agriculture, we need to move away from the old "information flows from the top down" theory. American farmers are multi-talented, versatile businessmen who can teach us much. The 1990 Farm Bill recognized this in authorizing funding for the Sustainable Agriculture Research and Education program (SARE)—but we need much more. I urge the committee to support additional, substantial funding in sustainable agriculture training programs which are designed to implement the open flow of information to—and from—the farm.

Let's Stop Beating Around the Bush

In her excellent statement, Dr. Batie says, "The second main objective for national policy we recommend is to increase the efficiency with which nutrients, pesticides, and irrigation water are used in farming systems. Nutrients, pesticides, and irrigation water are important inputs to modern agriculture. In most cases we cannot sustain the yields modern agriculture has achieved without using these inputs." This may have been true in the past, but it is not valid with today's technology.

We do not need only to increase the efficiency with which we use pesticides and chemical soil amendments. We need to rethink our agriculture from the ground up. We need to work on options to traditional chemical use. And move toward using these inputs as a last resort. That is the idea behind farming systems. That is what drives the sustainable agriculture movement.

The committee's Executive Summary points out that, in relation to the farming systems approach, the technologies and information already exist that, if implemented, will result in immediate improvement in soil and water quality. Using techniques like crop rotation, integrated pest management, green manures, plant diversity, and low-till, just to name a few, will greatly alleviate our national reliance on chemical pesticides and soil amendments. We already know how these chemicals work their way into our Nation's drinking water, change the soil biota and alter its chemical balance. We need to move away from overuse and misuse of agrichemicals. We need to put to full use the technology and experience we already have rather than teach more lessons in chemical usage. We need to work with nature, not against it. To my way of thinking, that is the main point behind these hearings.

We must stop rewarding environmentally negative farming practices. Instead, we must encourage and reward those farmers who incorporate the benign and potentially beneficial farming methodologies found in many of the sustainable farming systems.

It All Begins At the Farm Gate

While all the rhetoric raised at these hearings is refreshing indeed, let us not forget the American farmers who will be on the receiving end of what we finally decide needs to be done. We must include farmers in the discussions and decision-making process if any of the proposed programs are to succeed. Just as their input tells us which methodologies succeed or fail in "real farm" situations, farmers can help us make the right choices in these discussions, as well. As a Nation, we rely heavily on the handful of farmers who dedicate their lives to growing our food and keeping our Nation running, but, as in any other business enterprise, farming must be profitable for the farmer. As we consider which programs are worthy of implementation

and which can fall by the wayside, let us keep in mind that the ultimate success, or failure of these programs will all begin at the farm gate.

POSITION STATEMENT OF THE WORLD RESOURCES INSTITUTE

The National Research Council has done an outstanding job in its latest report, *Soil and water Quality: An Agenda for Action.* In my review comments I wish to highlight and discuss a few of what I feel are the most important conclusions and policy recommendations.[5]

> *Federal agricultural price support and supply control should be reformed to increase the flexibility participants have to diversify their cropping systems (p. 13).*

The report correctly identifies Federal commodity programs as a key barrier to the adoption of resource-conserving farming practices. While flexibility has been improved, significant barriers remain. Base acreage and crop limitations restrict the use of farming practices that are known to enhance soil and water conservation.

The current structure of the agricultural commodity programs can only go so far to enhance conservation objectives. While further improvement is possible these improvements will be marginal at best. The potential for much greater improvement exists.

> *Long-term protection of soil and water quality should be based on policies and programs that are independent of price support, supply control, or income support mechanisms; policies are needed that target problem areas and problem farms, regardless of participation in Federal commodity support programs (p. 14).*

The price and supply control programs now in place try to do too much and don't do anything very well. The bulk of the money goes to support the incomes of relatively wealthy farmers and agribusinesses instead of those who need the help; farmers who adopt resource-conserving practices that rely on biological means to maintain soil productivity and reduce pollution receive lower payments than those who instead depend upon chemicals and forego crop rotation; and fiscal costs are subject to the vagaries of weather and beyond the control of policymakers.

It would be in the interests of taxpayers, rural development and resource conservation if the commodity programs were eliminated and replaced with rural development programs to support those who need it, and stewardship programs based upon environmental services provided by farmers.

> *Research should be directed at the design of market-based incentives to protect soil and water quality (p. 16).*

The market is a powerful mechanism that has not been brought to bear in support of resource conservation in agriculture. The potential for applying market-based incentives is enormous and has many advantages over regulatory frameworks, notably, that the fiscal costs are much lower, conservation objectives can be achieved at lower overall costs, and farmers would have more freedom to apply creative solutions. In addition, market-based approaches provide a continual incentive for improvement and innovation, where regulatory approaches provide floors which few go beyond. A number of States apply input taxes to support sustainable agricultural research. A Federal tax should be applied on fertilizers and agrichemicals for the same purpose.

> *Two types of research should be high priorities for USDA and EPA research programs: (1) research directed at identifying the nature and magnitude of factors influencing producers' management of cropping and livestock production systems and (2) research leading to the development and implementation of new technologies, cropping systems, and methods to manage farming systems that are profitable and protect soil and water quality (p. 14).*

Publicly funded research should support public objectives. There is considerable evidence to suggest that more funding for resource-conserving production methods would result in financial gains for producers, to help them use inputs more efficiently, as well as economic gains to society, as environmental damages could be avoided. Congress should fully fund the Sustainable Agriculture Research and Education Program.

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[5] My comments are supported by policy research done at WRI on the economics of sustainable agriculture as reported in two publications, *Agricultural Policy and Sustainability: Case Studies from India, Chile, the Philippines and the United States* (Faeth ed., 1993) and *Paying the Farm Bill: U.S. Agricultural Policy and the Transition to Sustainable Agriculture* (Faeth et al., 1991).

In addition to the items noted in this recommendation, additional elements of this type of research should also focus on the incentives provided by agricultural policy, the economic costs and benefits of various production practices, and methods to amend national economic indicators to account for the depletion and degradation of natural resource stocks.

AMERICAN FARMLAND TRUST,
WASHINGTON, DC, *January 24, 1994.*

Hon. TOM DASCHLE,
Chairman, Subcommittee on Agricultural Research, Conservation, Forestry, and General Legislation, United States Senate, Washington, DC 20510.

DEAR CHAIRMAN DASCHLE: AFT appreciates your invitation to submit testimony on the National Research Council's report: *Soil and Water Quality—An Agenda for the Future.* We believe Dr. Sandra S. Batie, Chair, Craig Cox, Project Director and the Committee on Long-Range Soil and Water Conservation have prepared an excellent report that serves to clarify, for the Nation, the major objectives for the management of soil and water resources. We are also pleased to see the Subcommittee on Agricultural Research, Conservation, Forestry and General Legislation take a strong interest in this issue.

AFT has long believed that most farmers are both eager and able to protect the resources on which their lives (and ours) depend. There is also much that the Federal Government can do to encourage and help farmers to achieve conservation goals. AFT fully supports the report's recommendations that national policy enhance soil quality, promote efficient use of agricultural inputs, reduce soil erosion and runoff, and protect water with buffer zones. These concepts are well understood and we see no need to devote additional research dollars to their study. What we do need is research into how to integrate these concepts into an economically viable farm operation so farms will become both resource and economically sustainable.

AFT also agrees with the report's findings that suggest producers are receiving the wrong signals from the current Federal farm programs In case after case, farmers are making decisions trading off conservation for maintaining base or deficiency payments. This needs to be brought under control, if for no other reason than it's costly and inefficient to pay twice. Once for farm income support and once for conservation. AFT believes this should be done by disconnecting farm income support from commodity production and reconnecting it to targeted conservation needs. We believe, with careful resource protection planning and "green payments" to protect farm income in exchange for conservation, a sustainable agriculture and economically healthy rural communities are readily achievable. Without these changes, a further decline in farms, rural communities, and environmental quality is inevitable.

As you are aware, the current debate over soil and water quality has been catalyzed by recent legislation to reauthorize the Clean Water Act. Title III of S. 1114, introduced by Senators Baucus and Chafee, proposes to change the way America treats pollution on farmlands. We at AFT feel that by taking a close look at the ways farmers, conservationists, and other interested people have reacted to S. 1114, we can get a better understanding of how to forge a consensus soil and water policy that does the most good for the most people.

Enclosed is our analysis of farmers's and conservationists' reactions to provisions affecting runoff from farms, which we also request be entered in the record with this letter.[6] The report describes not only differences but also much common ground and must more room for compromise. We hope the committee will use it to that end.

Thank you for this opportunity to testify. If you have any questions, please contact me at the American Farmland Trust.

Sincerely,

(Signed) TIMOTHY WARMAN,
Director, Federal Policy.

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[6] Retained in Committee files.

COUNCIL FOR AGRICULTURAL SCIENCE AND TECHNOLOGY,
AMES, IOWA, *January 26, 1994.*

The Honorable THOMAS A. DASCHLE,
Chair, Subcommittee on Agricultural Research, Conservation, Forestry and General Legislation, Senate Agriculture, Nutrition, and Forestry Committee, Washington, DC 20510.

DEAR HONORABLE DASCHLE: I am pleased to respond to your invitation of January 21 to submit written testimony to the Subcommittee on Agricultural Research, Conservation, Forestry and General Legislation, Thursday, January 27 for the hearing on *Soil and Water Quality: An Agenda for Agriculture.*

Although CAST is unable to provide a direct approved review of the National Research Council's report, I am pleased to provide the following and kindly request it be submitted into the record.

Attached are 10 copies of the CAST executive summary of *Water Quality: Agriculture's Role* R120, December 1992, 103 pp. The CAST report chaired by Dr. Frank Humenik, is co-authored by 22 eminent scientists. This publication addresses many of the issues presented in the National research Council's report.[7]

I am also pleased to attach an advanced working draft of CAST's new issue paper— "Pesticides in Surface and Ground water."[8] This report acknowledges the detection of pesticides in the nation's drinking water, a few of which exceed legal water quality standards. Where detections occur the vast majority are well within the standards. However, these detections of minute pesticide quantities should provide an early warning system and recommendations are proposed to further reduce such levels.

Thank you for providing CAST an opportunity to share the scientific expertise comprised in these reports with you and your committee as you develop the legislation to ensure that the Nation's soil and water quality are protected and will continue to be valuable resources for the well being of our society.

Sincerely,

(Signed) RICHARD E. STUCKEY, PH.D.,
Executive Vice President.

NATURAL RESOURCES DEFENSE COUNCIL,
WASHINGTON, DC, *January 24, 1994.*

The Honorable Thomas A. Daschle,
Chair, Subcommittee on Agricultural Research, Conservation, Forestry and General Legislation, Senate Agriculture, Nutrition, and Forestry Committee, Washington, DC 20510.

Dear Senator Daschle: Thank you for inviting the Natural Resources Defense Council (NRDC) to submit written testimony on the recently-released report, *Soil and Water Quality: An Agenda for Agriculture.* In general, NRDC supports the findings and recommendations of the report. To further underscore the necessity of the on-farm soil and water quality planning and management changes recommended in the report, we hereby submit for the record testimony on runoff pollution submitted in 1993 to the Senate Environment and Public Works Committee for a hearing on the Clean Water Act. (Enclosed).[9]

Soil and Water Quality is an important contribution to the current debate concerning the reauthorization of the Clean Water Act. In the Senate, this debate has centered on the Baucus-Chafee bill to reauthorize and amend the Act, S. 1114. *Soil and Water Quality* makes a number of points that are germane to the debate over the scope, nature, and extent of water-sensitive measures that farmers should undertake, particularly in degraded and threatened watersheds.

In particular, three of the report's key recommendations are crucial points in the Clean Water Act debate:

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[7] Retained in Committee files.
[8] Ibid.
[9] Ibid.

(1) the need for "nonvoluntary approaches" in areas where "soil and water quality degradation is severe," and where individual farmers have been unacceptably slow to act;

(2) the need to "increase nutrient, pesticide, and irrigation use efficiencies;" and

(3) the need to make greater use of "field and landscape buffer zones," which should work as complements, but not substitutes, for increased efficiencies in farm inputs.

These three points, taken together, constitute a potentially powerful soil and water quality restoration policy. The report's recommendations for development of performance standards for management measures, and planning standards for whole-farm management plans, are also excellent and necessary elements of any sound "polluted runoff policy."

The June 1993 version of S. 1114 (a new version is due out this week) contains a blanket waiver for farmers with conservation compliance plans for the first 7 years after the bill's enactment. Our reading of *Soil and Water Quality* yields useful information in support of our view that conservation compliance plans, while important to the goal of soil conservation, are not in themselves water quality plans. As the report states (p. 118)

> "Erosion control on highly erodible lands alone, while important, will not adequately control loadings of nutrients, pesticides, salts, and sediments to surface water and groundwater.

Thus, conservation compliance is a necessary but insufficient tool for farm-level water quality protection, and thus does not deserve blanket exemption from farm-level water quality planning.

In the House, H.R. 2543, the Nonpoint Source Pollution Prevention Act of 1993 introduced by Representative Jim Oberstar, embodies much of the essential policy wisdom contained in the NRC report. The Oberstar bill requires farmers and other landowners in degraded and threatened watersheds that are polluted wholly or substantially by land-based sources to undertake flexible, site-level water quality plans. This basic approach to agricultural watershed restoration is highly consistent with the whole-farm environmental management planning, and degraded watershed "nonvoluntary" approach, advocated in the NRC report.

Other recent policy reports are consistent with the findings in *Soil and Water Quality*. Among these are the agricultural section in the *Water Quality 2000 Final Report* (November 1992); the *Report and Recommendations of the Nonpoint Source Evaluation Panel*, Chesapeake Bay Program (December 1990); and the "Final Report on Implementation of Section 319 Nonpoint Source Programs" of the Office of Policy, Planning, and Evaluation of U.S. EPA (November 1992). Taken together with this NRC report, these reports present a strong case for a strategic overhaul of our Nation's polluted runoff (nonpoint source) programs, an overhaul that will ultimately require a watershed (landscape) basis for water (and soil) quality management.

Thank you for giving NRDC an opportunity to present its view on *Soil and Water Quality*.

Sincerely,

(Signed) Diane M. Cameron,
Water and Coastal Program.

SOIL AND WATER CONSERVATION SOCIETY,
WASHINGTON, DC, *January 26, 1994.*

Hon. Tom Daschle,
Chairman, Subcommittee on Agricultural Research, Conservation, Forestry and General Legislation, United States Senate, Washington, DC 20510.

Dear Mr. Chairman: The Soil and Water Conservation Society appreciates your invitation to submit written testimony on the recent report by the National Research Council. This document entitled *Soil and Water Quality—An Agenda for Agriculture*, will be of great interest to the members of our society. However, your deadline of a written statement 24 hours prior to your hearing on Thursday, January 27, 1994 precludes our Board of Directors the necessary review time they require prior to approval of witness statements.

However, the society will be involved in the wide-ranging discussions that will be forthcoming resulting from this excellent publication. Dr. Sandra S. Batie, Chairperson of the Long-Term Soil and Water Conservation Policy Committee formed to study the problems of soil and water quality resulting from agricultural practices, made an opening statement on November 17, 1993 when the study was released for public use. We assume that your committee already has this explanation of the background related to the book. There is agreement by many that, "First, we need to change the way we look at soil". It deserves the same national attention as given water and air quality.

Perhaps your hearings will help in the process of defining the criteria needed to adequately judge soil quality. This will probably be even more complex then the criteria for air and water.

The Soil and Water Conservation Society has policy position statements on Water Quality and the Future Use of Conservation Reserve Program Acres. These are attached for your files. The society also has adopted guiding principles regarding *A National Nonpoint-Source Water Pollution Control Initiative*.[10] Your committee may find this useful as the Congress debates reauthorizing the Clean Water Act.

Thanks for the invitation to present written testimony. We regret our inability to respond in time for your hearing, but do agree there is need to initiate a general discussion of the policy and research objectives to help achieve any needed improvements in soil and water quality.

Best wishes,

(Signed) Norman A. Berg,
Washington Representative.

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[10] Retained in Committee files.

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